# MODERN Machine Shop

HOWARD CAMPBELL, Editor

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## CONTENTS




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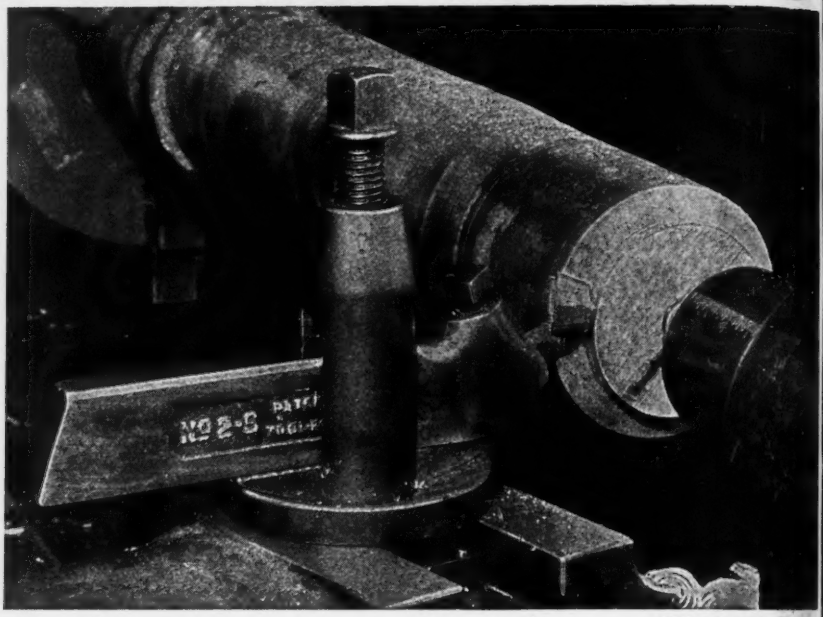

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MODERN Machine Shop

CINCINNATI, OHIO VOL. 7, NO. 5

OCTOBER, 1934

# Conveyors Expedite Production at the Hudson Plant

BY L. B. KEELER

THE plant of the Hudson Motor Car Company is an excellent example of the modern automobile plant. Being among the dozen largest plants of the automobile industry, the methods employed in the production and handling of materials are of the most modern type. Accordingly, a description of the conveying system in use in this plant should be of interest to the mechanical executives of this country who have not had the privilege of studying automobile shop methods at first hand.

The machine shop is crossed and re-crossed by lines of roller conveyors upon which the parts are moved from one operation to another. If the parts are large, such as cylinder blocks, or crankshafts, they are han-

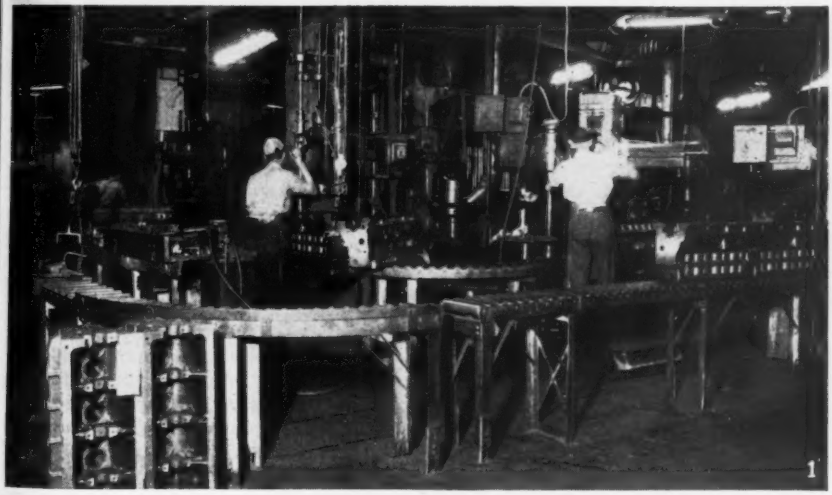

Fig. 1—Roller conveyors are used to handle large parts such as cylinder blocks.

Fig. 2—The motor assembly line. This line is power-operated, which means that a given number of motors are produced in a given period of time.

dled singly. If they are small, they are placed in quantities in suitable containers which are pushed along on the conveyors.

In Fig. 1 is shown a section of the roller conveyor system in the cylinder block department. Two lines are shown at this point, one line passing the machines in the background, and the other line being so aligned with the machine table that the tables actually form a part of the conveyor line. Thus the parts are moved directly from the conveyor onto the table of each machine in turn as they progress from one operation to another.

In the machining departments where the parts in process must be brought to a dead stop in order for the operation to be performed, the parts are moved from one operation to the next by hand. In the case of cylinders, for instance, the blocks are given a slight push on the conveyor, the momentum being sufficient to carry them to the next operation. Although occupying the minimum of space, the conveyor structure is sturdy, as can be seen by reference to the illustration. The supporting members are made adjustable, to meet conditions arising from uneven floors or to conform to varying heights of machine tables.

In the assembly departments the conveyors are usually of the power-operated type; that is, the motor or chassis rests on a platform or is otherwise attached to the conveyor so that, as the conveyor moves, the unit moves with it. Thus a definite rate of production is established, depending upon the speed of the conveyor.

In Fig. 2 is shown one of the Terraplane motor assembly lines. The motor rests on a swivel platform attached to a chain which is pulled by motors operating through a system of gear reduction at an average speed of four feet per minute. Each operator along the line has an individual

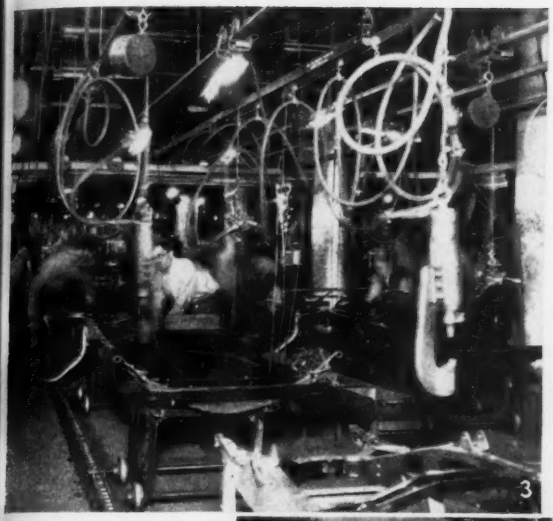

Fig. 3—The frame assembly. Here the springs, axles, muffler, and other under-frame parts are assembled to the chassis.
Fig. 4—Dropping a motor into place in the frame.

operation to perform, the amount of work required being just enough so that he can complete it while the conveyor is moving a given number of feet. Thus he is required to maintain a predetermined speed, or production rate that has been set by actual time study. There are always one or two "utility" men who are familiar with all operations and can help out anywhere along the line in case of trouble. These men are assigned to regular operations and are only moved in case of emergency. The assembling of the car as a unit actually begins with the assembling of the springs to the frame. One corner of the chassis assembly department, where this work is done, is shown in Fig. 3. There are four automatically-operated conveyor lines in this department, all moving in the same direction. The frame is

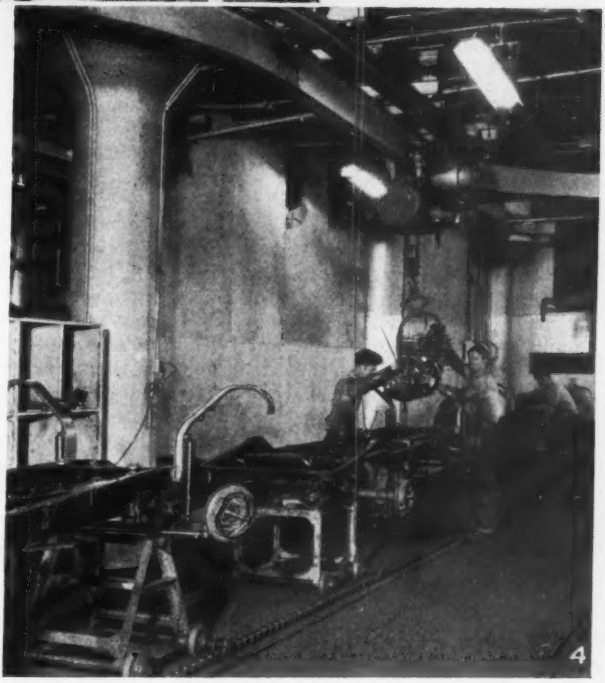

Fig. 5—The frame assembly is raised through an opening to the floor above where the chassis is painted and the wheels are put on.

received from the frame manufacturer with the spring hangers all riveted in place; thus the first operation in the automobile plant consists of assembling the springs to the hangers.

The department was working at top speed when this picture was made, and it was impossible to get the workmen to stop long enough to avoid blurs in the picture. However, the chains can be seen, together with the "trucks" to which they are attached. The frame is placed on a pair of trucks, one at each end. The chain is pulled slowly by power, carrying the frame along at a given rate of speed. Pneumatic riveting hammers, attached to long lengths of air hose, are suspended from overhead "trolley" lines so that they can quickly be moved to any point where they may be needed.

After the springs have been assembled to the frame, the axles are put on and then the muffler and other parts that go underneath the car are assembled. The frame is then turned over so that it will be in a normal position to receive the other parts that comprise the completed job. By the time the frame has reached the opposite end of the room from the starting point, it is ready for the motor, which is brought to the chassis by means of an overhead "monorail" conveyor. One of these conveyors, with a motor just ready to set down in the frame, is shown in Fig. 4. From here the frame goes through the chassis paint department and then to the wheel room, where the wheels are put on. Henceforth the chassis rides on its own wheels in dollies on a power-driven conveyor.

The illustration Fig. 5 shows the end of a frame assembly line on an upper floor. As the frame assembly is completed, it is picked up by grapples attached to a conveyor on an overhead monorail and is transferred to the chassis paint department on the floor above by the simple expedient

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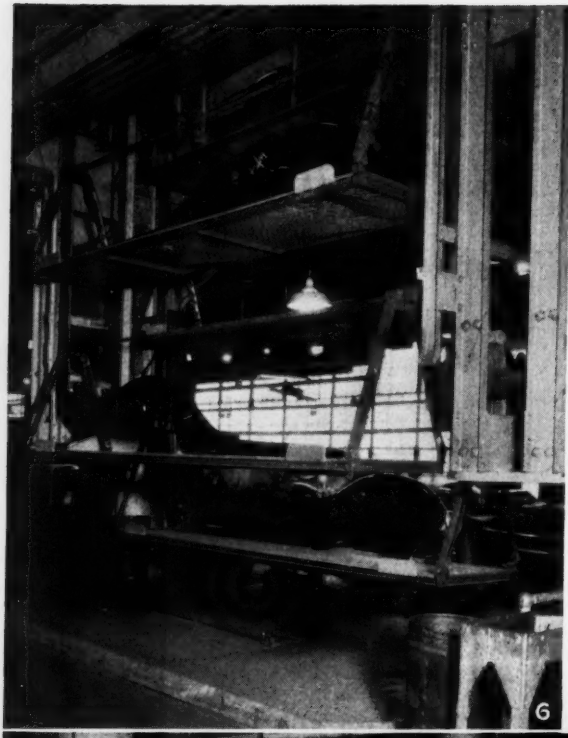

of raising it through large opening in t floor. The "lift" is this case operated b the girl visible throug the opening in the wa at the rear of the pi ture.

There is very litt room along the chas assembly line for t storage of such larg parts as fenders, these parts are depo ited at the point wher they are required b means of a vertic conveyor, shown in Fig 6. This conveyor act

Fig. 6—Fenders are brou down two stories to t point of use on the chas assembly floor. Fig. 7—T bodies enter the trimmi department here. In thi department the body i trimmed and the seat back and cushions are assembl in place.

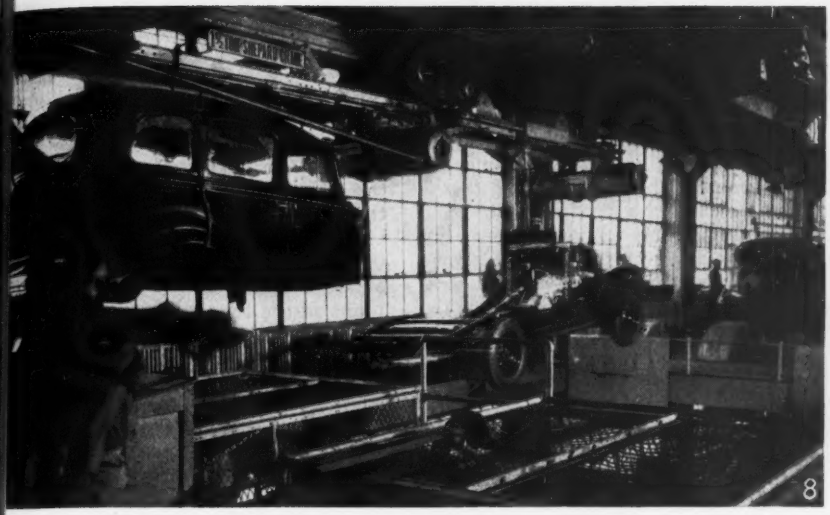

Fig. 8—The chassis shown suspended from the monorail lift has been hoisted from the floor below. After it has been set in place on the final assembly line the body shown suspended at the left is lowered onto it and is anchored in place.

ally carries the fenders down two floors. As they reach the lowest point in their journey they are removed by a workman who assembles them to the chassis. By scheduling the placing of fenders on the conveyor, the movement of fenders to the chassis assembly department can be synchronized with the production.

At this point in our story it will be necessary to leave the chassis assembly and go back to the point at which the bodies are received from the body plant. As the bodies come in, they consist practically of the metal shells, painted and finished on the outside but without seats, cushions or other upholstery. The making of seats and cushions are functions of the automobile plant proper, rather than the body plant.

Each body is received, from the body plant on low trucks, as shown in Fig. 7. At the beginning of the line the trucks are pushed about the floor so as to make it possible to perform certain operations before the body is placed on the trim line. The trim line is power driven, the wheels on the body running in grooves in steel channels anchored to the floor.

The operators shown in Fig. 7 are covering the interiors of the bodies and are building in the seat structures. At a point farther along the seat cushions are supplied by conveyor from the cushion department. When the instrument mounting board is assembled to the body, the body is finished as far as it can be without being in position on the chassis.

The illustration Fig. 8 shows the point at which the chassis and body come together. At the left can be seen a body suspended from a monorail conveyor. This is the end of the body assembly line and the body shown suspended is finished, ready to be assembled to a car chassis. At a parallel point on the floor below is the end of the chassis assembly line. As each chassis reaches this point, it is

picked up by a monorail "lift" operating from the ceiling of the lower floor—or the floor of the body assembly department — to the position shown in the illustration.

With the chassis lifted high enough to clear the safety fence around the floor opening, the lift is moved to the right and the chassis is set down on the final assembly conveyor line. Immediately afterward the body shown suspended at the left in the illustration is moved across the opening and is lowered into place on the chassis, where it is bolted. The car is now ready to be started under its own power.

The illustration Fig. 9 shows the motors and speed reducer units required to operate a single line of power conveyors such as those described above. Three 15 h. p. motors are used, operating at 1200 r.p.m., and this speed is reduced, by means of speed reducers, so that each conveyor line is operated at a speed of 7½ feet per minute. At the time these pictures were taken, each assembly line was delivering 37 finished cars per hour, or a total of 111 cars per hour on the three lines.

Mechanical handling of parts and materials is a necessity in any plant where continuous production is a necessity, or even a possibility. Not only will mechanical handling pay for itself many times over in the saving of man-power, but if handled properly it can be timed so that a given amount of production can be planned and obtained. The most elaborate and the most efficient conveyor systems in the world are those in use in the automobile factories, but the principles upon which the systems are planned and executed can be applied in any plant where the product is of a standardized nature and the production is sufficient to warrant the cost of the installation.

## Norton Mounted Wheel and Mounted Point Catalog

The new list prices and new methods of designating the different shapes and sizes of Norton mounted points and Norton mounted wheels which became effective September 1 are completely covered in an entirely new catalog that can be obtained by addressing a request to Norton Company, Worcester, Mass.

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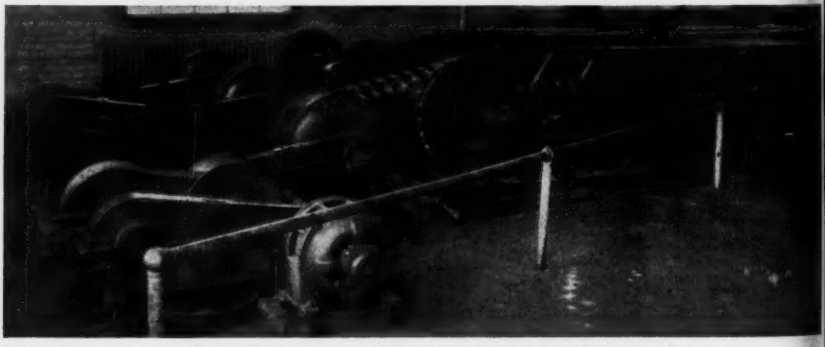
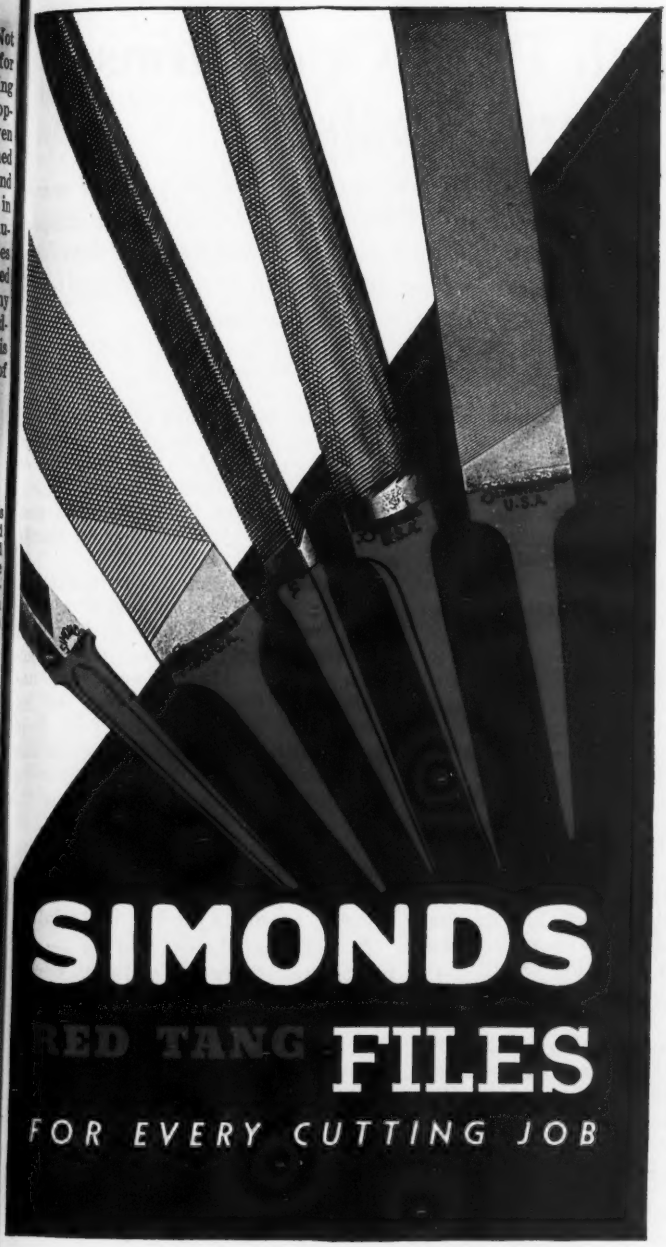


**Fig. 9—The power mechanism for the assembly lines.**

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# Punch Press Operations and Tools, 1

*Tools for the fashioning of parts from sheet metal present some interesting problems in design. This article, dealing with simple dies, is the first of a series that will discuss blanking dies, bending dies, combination dies, and other tools of increasingly intricate design as the series progresses.*

By C. L. Szalanczy

THE simplest and most commonly-used types of cutting dies as applied to punch press operation are the following: (1) cut-off dies, (2) severing dies, and (3) blanking dies. The functions of the three types of dies mentioned are identical to the extent that each completes and produces a blank at each stroke of the punch press.

The type of die used to produce a blank is determined by several factors. First, the shape of the blank must be taken into consideration, then the thickness of the material from which the blank is to be made. It must be known whether the material is standard width strip stock as it is rolled at the mill, or whether it is sheet material which first must be sheared into strips. In either case there will be slight variations in the sizes of the material, because there is a permissible variation on all materials rolled.

In case the material is sheared, there will be a variation caused by the wear on the shears and slight movement of the gages due to the pounding shock on the shear during the cutting operation. This variation can be held to the minimum by frequent checking of the gages by the shear operator.

Another factor that must be taken into consideration is the amount of money available for the building of the tool. This matter is, of course, usually based on the estimated production or the total number of blanks required.

If methods common to present day manufacturing are followed, all the work produced will be well inspected and must be held to close limits of accuracy. The blanks must be unmarked on the surface and the cut sides must be practically free from burrs. This degree of perfection can be obtained in blanking by allowing the correct amount of clearance between the punch and the die. On cut-off and severing dies, the cutting edges of both the punch and the die must be kept sharp so that a clean cut will be made on the material.

It has been determined by experiment that there is a limit beyond which the work produced by a cut-off die is unsatisfactory. Bearing this fact in mind, it may be stated that cut-off dies should not be used on soft materials such as copper, soft brass, or aluminum when the thickness of the material is more than 1/32 inch.

On harder material, such as cold rolled steel, tool steel, or spring steel, the limit should be 3/32 inch. The

action of a cut-off die is illustrated in Fig. 1. As shown, the tool actually cuts only a small part of the way through the material, weakening the

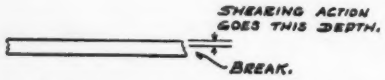


**Fig. 1—Drawing showing the sheared edge of a blank.**

material sufficiently so that it breaks under the pressure of the tool, leaving a rough edge. The breaking action tends to make the blank longer at the bottom than it is at the top. Also, the pressure of the punch on the material leaves an impression such as that shown in Fig. 2.

When material that is too thick is being cut, this condition can hardly be avoided on account of the construction of the punch. A punch of typical design is illustrated in Fig. 3. In cases where the impression left by

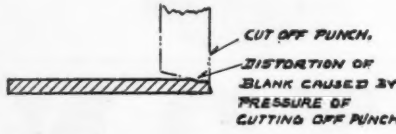


**Fig. 2—The cutting-off punch leaves an impression in the work.**

the punch and the tapered break on the edge of the blank come within limits that will pass inspection, a die of this type may be used for cutting off material up to ⅛ inch in thickness.

The illustration Fig. 4 is a drawing of a small section of copper that is to be cut from the bar, for which the cut-off die indicated in Fig. 5 is to be used. While a tool of this type is inexpensive from the standpoint of building costs, it is highly productive as the press may be run continuously. The press operator has only to feed the material into the die.

The die set A, Fig. 5, may be made in the shop where the tool is made, or it can be purchased. There are several good types of die sets on the market. Usually the commercial sets are made of cast steel and will stand up far better than the cast iron shoes, although for punching paper, mica, or fuller board, the cast iron shoes answer the purpose very well.

The commercial shoes are machined and ground on both top and bottom, and are provided with re-

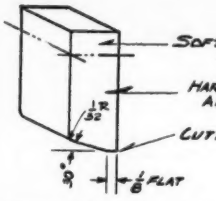


**Fig. 3—Typical design of cutting-off punch.**

movable guide or alignment pins. These pins facilitate rapid setting of the die in the press, and eliminate the hazard of the die slipping or shifting during operation. The upper, or punch, shoe is provided with a stem which is held in the press ram. The lower, or die, shoe has lugs and slots for clamping the die to the bolster plate on the punch press table.

The die piece B is made of a good grade of tool steel. It is fastened to the die shoe by means of mill body

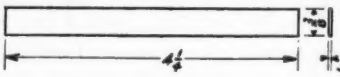


**Fig. 4—Example of work for which the die shown in Fig. 5 is used.**

machine screws, and is secured in place by two dowel pins so that it cannot shift. The die is machined very nearly to size, then it is hardened to about 80 to 90 points scleroscope. After hardening it is ground

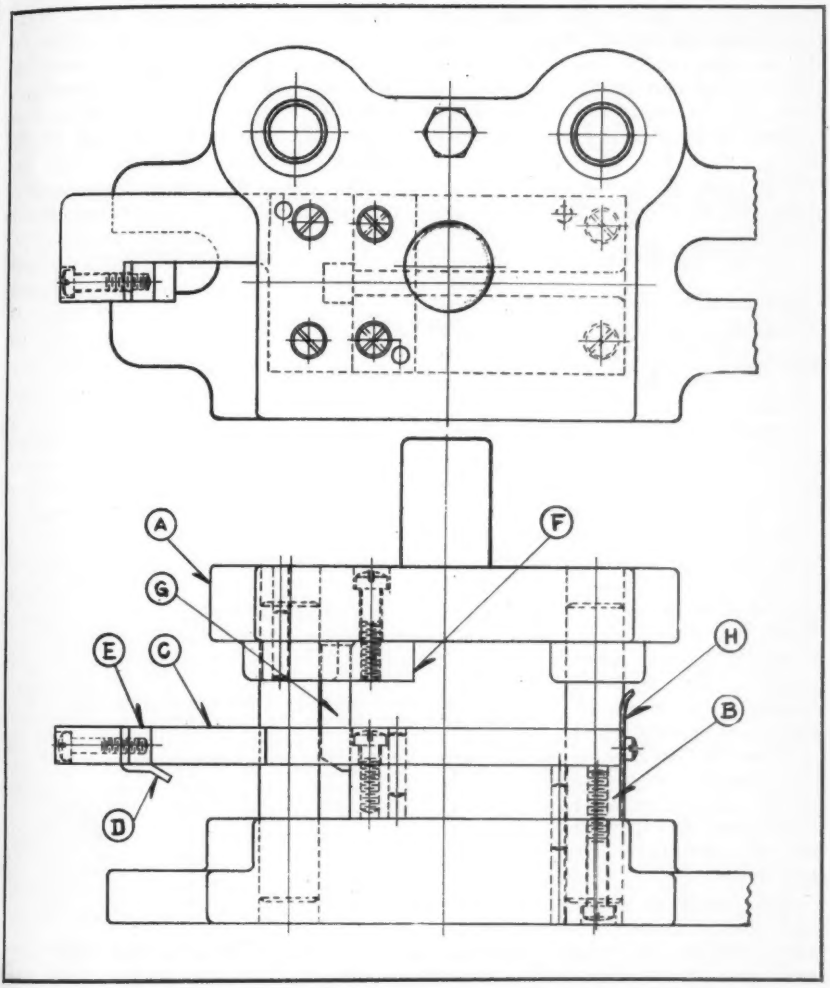


Fig. 5—Design of blanking die for cutting off the copper strip shown in Fig. 4

to size on the top, bottom, and cuting side.

The stripper C is used primarily as a guide to the material being cut, and may be of either hot or cold rolled steel. It also helps to support the punch G. The guide groove is made slightly larger than the width of the material and about one-half higher than the thickness of the blank. The entrance is widened slightly to help the operator of the press to insert the strips into the opening. The stripper is fastened to the die with fillister head screws, and is held by two dowels to prevent movement.

These dowels and screws should function independently of these sets into the die shoe for holding the die; thus the stripper can quickly be removed when the die needs to be ground, and without disturbing the position of the die.

The hook D on which the blank rests before it is cut off is of cold rolled steel. It is held between the stripper and a hardened piece of tool steel E, which acts as a stop. The stop is ground on both sides, and is so set that the dimension of the blank is maintained between it and the cutting edge of the die. Items C, D, and E are held together by a single fillister head screw. The punch holder F is made of either hot or cold rolled steel and is fastened to the punch shoe by means of fillister head screws and two dowels set as far apart as possible.

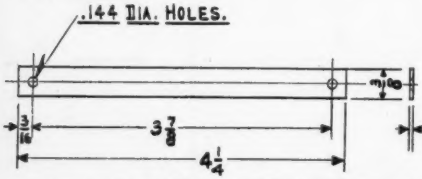


Fig. 6—Piece blanked and pierced in one operation.

The punch G is of tool steel, hardened to about 80 to 90 points scleroscope and ground to size. The top of the punch is left soft for peening purposes. This soft end also reduces the chance of the punch working itself into the punch shoe from the continuous hammering to which it is subjected. As indicated in Fig. 3, the punch is ground all over and off an angle toward the back. This design has been found to produce the best results, due mostly to the fact that it retains its cutting edge well. While there is plenty of section where the section is required, the surface that comes in contact with the material is greatly reduced, thus tending to eliminate distortion or marking of the blank as shown in Fig. 2.

The guard H is made from a piece of 1/16 in. thick sheet steel and is fastened to the stripper so that it stands upright. An opening is provided in the guard so that the material can be fed through it into the stripper groove. The upper end of the guard is curved outward, toward the operator, as shown in the illustration. Having the guard curved in this manner and made long enough to extend past the top of the stripper is a safety measure; it precludes the possibility of the operator having his fingers crushed.

**CLEARANCE ON DIAMETERS**

| Thickness of Material. | Copper & Brass. | Soft & Medium Steel, Phos. Bronze. | Hard Steel (Spring St.) Sheet Tool Steel |
|---|---|---|---|
| 0.015 | 0.001 | 0.001 | 0.001 |
| 0.020 | 0.001 | 0.001 | 0.001 |
| 0.028 | 0.001 | 0.002 | 0.002 |
| 0.032 | 0.002 | 0.002 | 0.002 |
| 0.046 | 0.002 | 0.003 | 0.003 |
| 0.0625 | 0.003 | 0.004 | 0.005 |
| 0.079 | 0.004 | 0.005 | 0.006 |
| 0.093 | 0.005 | 0.006 | 0.007 |
| 0.109 | 0.006 | 0.007 | 0.008 |
| 0.125 | 0.007 | 0.008 | 0.009 |

### Pierce and Cut Off Dies

When one or more holes are punched in the blank at the same stroke of the press in which the cutting-off operation is performed, a more complicated type of tool, known as a combination die, is required. The tool used for the operations specified is called a pierce and cut off die. Figure 6 is a drawing of a piece of work produced by such a die.

The design of the die is shown in

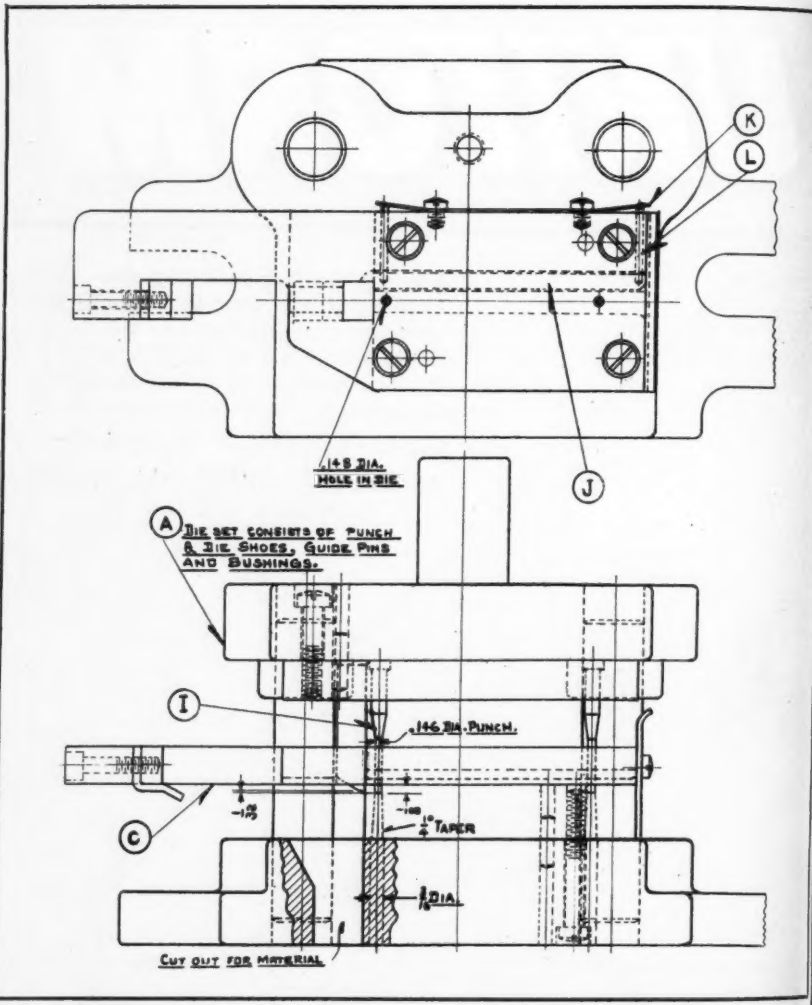


**Fig. 7—Design of pierce and cut-off die for producing piece shown in Fig. 6.**

Fig. 7. All parts of the die are identical to the die described above with the exception that the piercing punches I are now inserted into the punch plate, which is made longer than the plate in the cut off die. Note that the punches are 0.146 in. diameter, or 0.002 in. larger than the size of the holes in the blank. This dimension is in accordance with a set rule, which is as follows:

When punching holes to size, the punch is made to the same size plus 0.001 in. for material up to and in-

cluding 1/32 in. in thickness. For material of 1/32 in. to 1/16 in. thickness, 0.0015 in. is added to the diameter of the punch. For material 1/16 in. to ⅛ in. thick, 0.002 in. must be added. This information is for holes from 1/16 in. to 1 in. diameter, inclusive. No allowance is required on larger diameters.

The die must be made to the punch diameter plus the necessary clearance as shown in the following table.

To find the clearance for any other thickness, divide the thickness of the stock by these constants: 20 for brass, copper or soft steel, 16 for medium rolled steel, and 14 for hard steel.

The stripper is usually provided with a spring-operated, hardened steel bar J which acts to keep the stock or blank material in constant contact with one side of the stripper groove. Thus, regardless of any possible variation in the width of the stock, the holes will always be the same distance from the one side of the blanks. By following the dimensions on the drawing, Fig. 8, the stripper can be built and assembled without further explanation.

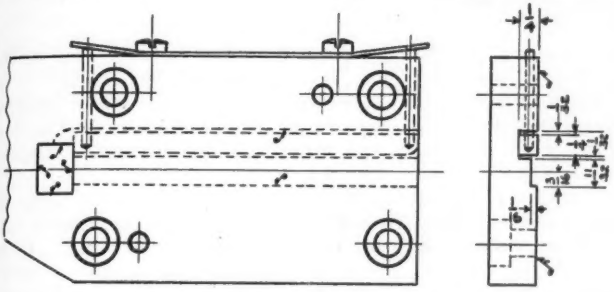

Fig. 8—Drawing illustrating design and manner of using the stripper.

The part K, Fig. 7, is a flat spring of 1/32 in. spring steel, fastened to fillister head screws. The pins L are of ⅛-in. stub steel, cut to the required length and pressed into "press fit" holes in the stripper bar. The spring and pins prevent the stripper bar from coming out and getting lost.

Of particular note is the cut-out section in the die shoe, which is in line with the cutting off punch so that the finished blanks will fall through the opening in the bolster plate to the receptable below.

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# High Lights on the Tempering and Straightening of Tool Steels

By Wm. C. Betz

PROBABLY the oldest known method of hardening consisted in cold working the metal, by simply hammering the tool or weapon, until an appreciable increase in cutting ability was obtained. This method was apparently first used on copper and its alloys, then later on iron. Practically all malleable metals, in their pure states or alloyed, can be hardened to a greater or less degree by cold working. But hardening by heat treating processes, as we now know them, is limited to alloys.

Occasionally we hear of wonderful feats of heat treatment that were performed in past ages, and it is legendary that the ancients hardened copper by a method that is unknown to present day metal workers. However, to the best of our knowledge pure copper has never been hardened, either by the use of chemicals or by heat treatment. Excepting cold worked specimens, the only hardened copper in existence today is copper that has been alloyed with other metals. Perhaps the "lost secret" of tempering copper consisted merely in peening, with iron or stone tools, pure copper or the metal containing a certain amount of alloy. Tools made in this way, while far inferior to present-day examples, nevertheless will hold an edge to some extent, may be deflected slightly without taking a permanent set, and on the whole have characteristics roughly similar to those of their heat treated successors.

One reason why we do not find more iron tools of ancient manufacture is that iron returns to its natural state in the form of iron oxide, or iron rust, in a short time. It is therefore difficult to study ancient hardening technique as applied to iron and ferrous alloys because examples of such work are rare.

Most of the printed discussions of modern heat treating deal with the hardening phase of the art. It is seldom that the tempering or drawing phase is discussed in great detail, and inasmuch as there are many methods of drawing that are not understood as well as they might be, the author presents such data as he has gathered in many years of experience and research along this line.

After a steel tool has been hardened it must practically always be drawn before it can be used most efficiently, and any reheating after the hardening quench acts as a drawing operation.

Although the original Taylor and White heat treatment for high speed steel involved a draw after the quench, for years many hardeners ignored this important point, and tools were put into service with no draw whatsoever. Research and innumerable practical shop tests have however demonstrated the tremendous importance of proper drawing heats for high speed tools. After the customary quenching operation, the temperature for which is generally between 2200 deg. - 2400 deg. F., the tools are most commonly drawn between 1050 deg. - 1150 deg. F., the exact temperature being of course governed by individual requirements.

Authorities differ on the length of

time at the drawing temperature required for best results. Some feel that the old "one hour per inch of section" is sufficient, while others advocate six or eight hours for even relatively light tools. But all are agreed on the importance of the drawing operation for practically all applications. It is only in this way that tough, strong tools, having maximum hardness and wearing properties, can be produced for use on modern rapid production operations.

High speed tools should not be quenched from the drawing heat, but should be allowed to cool in the air. Plain carbon and alloy steels must also be drawn in various ways for various purposes.

Tools used in and around the machine shop and woodworking shops are usually drawn either to color, which is the older and less reliable method, or to definite temperatures, which is undoubtedly the preferable manner, since if the time element is also controlled, results can be duplicated accurately from lot to lot of material.

In color drawing, the tool, polished after quenching, is usually held over a flame, laid on a hot plate, or rolled in hot sand. In the hands of a skilled operator excellent results can be obtained, but where the human element plays such an important part variables are likely to enter.

Mass drawing to color can be accomplished in a heated metal tumbling barrel, into which the burnished and cleaned parts are loaded. To avoid excessive scratching, the speed of revolution should be approximately 10 r. p. m. The constant rotation of the barrel prevents localized overheating, so that very uniform results can be obtained. Of course frequent inspection of the material in the barrel is required, in order to stop the process at just the right point. When the correct color has been obtained the work is removed from the barrel and allowed to cool in the atmosphere, or probably better, quenched in oil.

Drawing to definite temperatures can be done in various ways. Perhaps the oldest, and still for many purposes an entirely satisfactory method, is the use of a heated bath of high flash point oil, in which the parts to be drawn are immersed. Temperature control may be manual or automatic, with temperature indications provided by a thermometer or pyrometer. An oil bath can be used successfully from 200 deg. F., or even lower, to about 575 deg. F. Some oils may be obtained with flash points higher than 575 deg. F., but operation even at 550 deg. F. is usually accompanied by unpleasant smoking and fuming.

Above 575 deg. F. drawing baths may still be used, but they consist of molten metals or salts. Lead, melting at 621 deg. F., finds some application, but salts, made up generally of sodium and potassium nitrate and nitrite, are far more popular. It is possible to obtain satisfactory drawing salts for temperatures as low as 300 deg. F., and as high as 1200 deg. F. Above 750 deg. F., pyrometers rather than thermometers are generally used for temperature indications.

A somewhat more recent development in drawing equipment is the electrically heated furnace, provided with a fan for forced circulation of hot air through the charge. Such furnaces, made by several manufacturers, are undoubtedly remarkably efficient with respect to quality of output, and economical if large volumes of work are to be drawn. They may be obtained for temperatures from 200 deg. F. or less, to 1300 deg. F.

Molten salt baths also make very

satisfactory coloring mediums for polished or freshly machined steel parts. In most cases colors obtained in this manner are for ornamental finish, and are not related to the hardening of the piece. In addition to the normal color range, from straw to blue, a bath is available which imparts an attractive black finish.

Obviously drawing by instrument readings rather than by color permits more accurate temperature control. Another great advantage lies in the fact that color drawing is invariably rapid, in order to prevent passing the desired color, while drawing at a specific temperature may be prolonged indefinitely.

It is always more desirable to draw a piece of work for a long period at a low temperature than to draw more quickly at a higher temperature. The reason for this is that in the long draw at the lower temperature the stresses of hardening are relieved gradually and more completely, leaving a much tougher structure in the metal than if it is drawn rapidly at a higher temperature. Hardness readings may, however, be the same in both instances.

In some cases it is more desirable to draw a large piece of work for from eight to twelve hours at a temperature ranging from 250 deg. to 300 deg. F. than it would be to draw the same piece one hour at 475 deg. F. This statement is especially true of large sections. Surprisingly long drawing periods are required to relieve hardening stresses in large masses. Of course, if hardness is to be retained, such stresses cannot be relieved completely. But for any given hardness there is a condition of minimum stress, which can be reached only through a relatively long draw. It should be remembered that prolonged drawing at any temperature will reduce hardness below what would be obtained by drawing at the same temperature for a shorter time.

As an example of the above statement, a case is cited of a chrome carbon steel ball bearing ring that was hardened to give a reading of 62 on the Rockwell C Scale, and was then placed in a tank of boiling soda ash solution, where it was left for about three months. Upon removal, the ring registered 35 on the Rockwell C Scale, which would seem to be an extreme case, but it fully demonstrates the possibilities of reducing hardness by low temperature draws when continued for long periods of time. Those who use relatively long draws at lower temperatures to obtain specified hardness are not likely to have the sad experience of seeing a large section of hardened tool steel fly into pieces a day or two after its heat treatment.

Large pieces should never be permitted to cool completely in the hardening quench, but should be removed from the water or oil while still quite warm and drawn immediately. It is a difficult matter to recommend definite temperatures at which parts should be withdrawn from the quench. It is even more difficult to gauge temperatures while the work is in the quenching medium. Largely it is a matter of experience and judgment.

In heat treating long, slender sections of high speed steel, it usually happens that the pieces come back from the quench badly warped. These pieces can easily be straightened if they are removed from the quenching oil when still very slightly red, at about 1000 deg. - 1100 deg. F., and placed in the straightening press immediately. Straightening operations can be carried out safely while the work is dropping to a temperature of about 650 deg. F.; below this point is the danger zone, in which breakage is likely to occur.

Handling high speed steel in this way will not reduce the hardness of the finished tools. Reheating the piece after it has once cooled below the manipulation temperature, and then attempting to straighten, will almost invariably result in failure because in the cooling process the steel assumes a permanent "set" that no amount of reheating will ever restore unless the piece is annealed and rehardened.

After the piece has been straightened and allowed to cool below 200 deg. F., it may be drawn for secondary hardness. It must not be drawn until a temperature of about 200 deg. F. has been reached, or the drawing operation will not be effective.

Warped plain carbon and alloy tool steel tools may also be straightened, but the job is much more delicate and dangerous than is the case with high speed steel. Some prefer a method similar to that outlined for high speed steel, except that the temperature for withdrawal from the quenching medium is necessarily much lower. Others straighten while hot, upon reheating after the hardness operation. Needless to say, the highest possible reheating temperature consistent with the hardness required in the finished parts should be used. Reheating temperatures between 500 deg. - 600 deg. F. are, however, generally considered objectionable, because in this zone most steels show abnormal brittleness.

The work to be straightened should be clamped in a vise or press and bent in the direction opposite to the warp to a distance equal to the amount of the warp. Permitting the piece to cool while thus bent is generally considered desirable. If it has been straightened properly it should immediately be drawn to the hardness required, to remove stresses that may have been set up in straightening. If the part is not straightened within the required limits, the process must be repeated.

Sometimes with delicate parts careful peening on the concave side gives good results. In production straightening, pieces are frequently heated with an acetylene torch only at the point of maximum deflection, thus eliminating heating all over. This, however, is not a simple job, for it requires experience and skill to avoid overheating.

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**LANDIS COLLAPSIBLE TAPS.** The Landis Machine Company, Tap Division, Waynesboro, Penna., has for distribution two bulletins giving detailed information and complete specifications of the new Landis Collapsible Taps. The Style LT Collapsible Tap for straight tapping is covered by Bulletin No. G-83, while the Style LM Receding Chaser Collapsible Tap for tapered work is covered by Bulletin No. G-81.

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**"LOWER YOUR PRODUCTION COSTS"** This 4-page folder, issued by Mendes Cutting Factories, 505 Fifth Ave., New York, N. Y., tells the "inside story" on economical wheel dressing. The folder contains interesting and valuable information concerning industrial diamonds and the D-P Angle Diamond Dresser in particular. A list of the tool sizes to be used with each size of grinding wheel, together with prices, is included. Copies free upon request.

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**CONWAY CLUTCH BULLETIN No. 36** Bulletin No. 36, issued by The Conway Clutch Co., 1545 Queen City Ave., Cincinnati, Ohio, is a complete exposition of the principles of design and construction of the compression clutches made by this firm. Included in the text are descriptions of the new Conway compression sleeve clutches with asbestos friction, including a number of improvements in design to meet conditions of heavy and severe service.

The bulletin contains complete tables of sizes and specifications of the clutches, together with prices. Copies of the bulletin are available without charge to mechanical executives and engineers.

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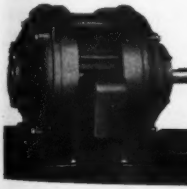

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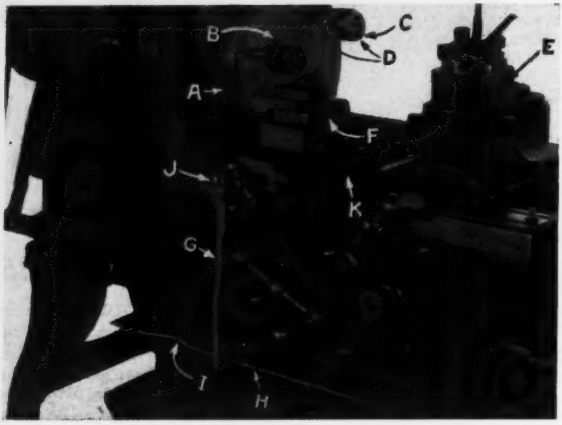
# IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . Each one published will be paid for.

## An Interesting Pulley Job

By A. E. Granville

AN OLD lathe fitted up in an unusual way for machining three-spoked pulleys is shown in the illustration. The pulleys are held and driven by three clamping jaws, held by heavy studs that are screwed into the special faceplate A. Each stud carries a pair of jaws, one stationary and one adjustable, the stationary one being held on the stud by a set-screw as at B. The outer, or adjustable, jaw is clamped to the pulley spoke by a square head screw C, tapped into the stationary jaw and working through a drilled hole in the adjustable jaw, the jaw sliding on the stud. The two jaws on one of the studs are shown at D, with the adjusting screw lettered as on the other set of jaws. The third set of jaws is hidden behind the tool turret. The bar used for boring out the hub is carried in the toolblock E. A hub end-facing tool and a rim rough-turning tool are carried in a special turret, on the back end of the lathe saddle, partly hidden behind the boring tool block.




Lathe Equipped for Crowning Pulleys Automatically

The crowning operation is performed by a tool carried in the toolblock F on the cross-slide. The feedscrew for the cross-slide is released for this work and the cross movement is obtained through the working of the lever G, which swings on a bar carried in a bracket that is bolted to the end of the cross-slide ways. The lower end of this lever rides along the edge of a heavy sheet steel plate H, which is bolted to the underside of the lathe bed, as shown. At I is a rounded depression so shaped that, as the lever G follows the curve, the cutting tool is moved out and in accordingly, thus crowning the pulley. This is accomplished by having the adjusting screw J, in the upper end of the lever, butt against the cross-slide. The cross-slide is held against this screw by means of the spring K, at-

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tached to the front of the ways and at the back end of the slide. The action of this spring not only keeps the end of the cross-slide firmly in contact with the adjusting screw in the upper end of the lever, but also keeps the lower end of the lever against the edge of the guide, or cam, plate H, as can be seen.

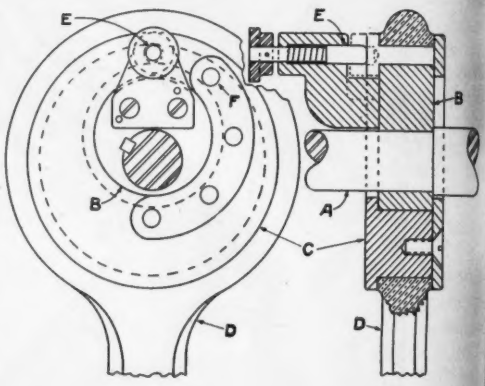
## Double Eccentric With Variable Throw

By J. E. Fenno

THE use of eccentrics for imparting a short reciprocating movement has been limited in the past to applications where the stroke remains constant. If adjustment is required to vary the length of the stroke, a crank is usually selected as provision can be made for adjustment of the crankpin radially. However, if the reciprocating member is located near the center of a relatively long driving shaft, the crank is not an economical solution. This condition occurred in the design of one machine and was met in a very simple manner by incorporating in the mechanism a double eccentric so designed that a rapid adjustment could be made in order to change the length of the stroke. The arrangement is shown in the accompanying illustration.

Upon driving shaft A is keyed the eccentric B, which is a free fit in the outer eccentric C. In the outer groove of the latter eccentric is mounted the strap D which transmits the reciprocating movement to a slide (not shown). By employing two eccentrics, the throw can be varied to suit the requirements of the application.

Assuming that both eccentric B and C rotate as one from the position shown, then the outer periphery of eccentric C is concentric with the shaft; hence, rotation of the shaft would result in strap D remaining stationary. Consequently no reciprocating movement would be imparted to the slide. However, if the eccentric C is rotated by hand relative to eccentric B until the locking plunger E enters




Drawing Illustrating Design of Double Eccentric with Variable Throw

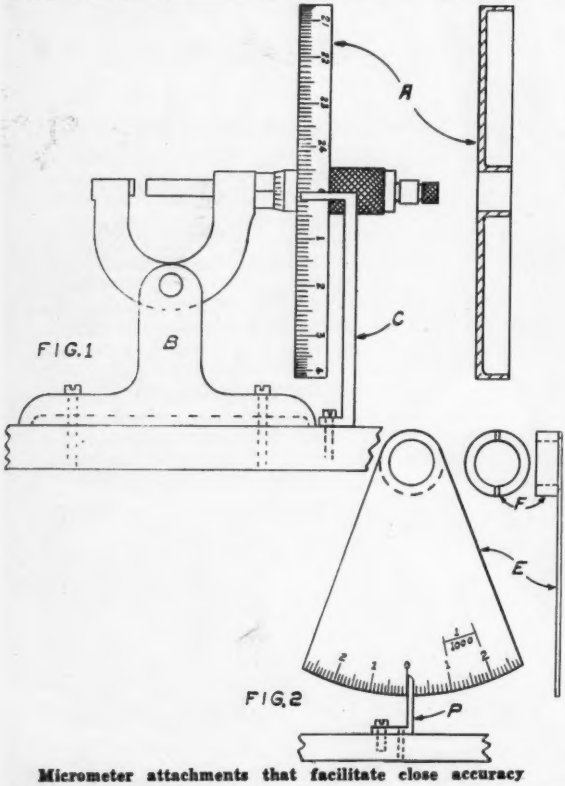
hole F, then the periphery of eccentric C will be offset from the shaft. As a result, a corresponding reciprocating movement will be transmitted to the slide.

By engaging the plunger with each hole successively, the throw of the eccentrics will be gradually increased. Thus, the required stroke of the slide is obtained by engaging the locking plunger with the proper hole. The throw range of course depends entirely on the eccentricity of the members B and C. In adjusting the stroke, a round rod of a size that will permit insertion in one of the indexing holes will facilitate the rotation of the eccentric C.

# A Micrometer That Reads to Tenths

By Charles Kugler

IN MAKING gages, the writer has found that better work can be done if an auxiliary spindle for a micrometer can be made so that the graduations will be farther apart, thus making it possible to work to closer limits. In order to achieve this object, he has at times used both of the attachments shown in the drawing. The enlarged spindle shown in Fig. 1 is the most desirable, but that shown in Fig. 2 is the cheapest to make. In using either one it is not difficult to estimate to within 0.00005 inch, as the 0.00001 divisions are approximately 1/16 inch apart.




Micrometer attachments that facilitate close accuracy

In Fig. 1 the micrometer is shown as fitted with an aluminum disc A that is 5 inches in diameter. The hub of the disc is bored to a light push fit on the micrometer spindle, and is very light in weight, as can be seen from the sectional view at the right. With the graduations a shade over 1/16 inch apart, the periphery of the disc can be graduated into 250 parts, each of which is equal to a spindle travel of 0.0001 inch. The micrometer is used to best advantage when held in a stand B on a plate which also supports a knife-edge stop C.

The attachment shown as Fig. 2 consists primarily of a segment cut from a sheet of 1/16-inch brass and bored to a press fit on the collar E. Using the indexing head, the segment is graduated at the periphery so that the graduations are about 1/16 inch apart. Each graduation represents a spindle travel of 0.0001 inch. Two slots are cut in the collar F to a depth that will leave about 1/16 inch of material to hold the two halves of the collar together. This makes it possible to squeeze the two sides of the collar together enough so that it will hold its place on the spindle, yet be free enough so that it can be revolved on the spindle by hand. This is necessary because the segment must

be re-set on the thimble from time to time so that the zero on the segment E will be in line with the knife edge stop P at the same time that a graduation on the micrometer thimble coincides with a graduation on the barrel.

In either of the methods described, the one-tenth graduations are far enough apart so that a graduation can be split with ease. The micrometer used with the segment Fig. 2 should be held in stand as with the large spindle shown in Fig. 1.

## Cutting Left Hand Threads With a Right Hand Tap

By P. M. Wilder

THERE are a number of electric tools on the market in which use is made of left hand screws or nuts, or both. It has been my experience that invariably when one of these tools is needed most it will be found laid up for repairs with a screw or nut missing. And usually it will be the left hand one, further delaying the job from three to four hours if the usual procedure is followed in duplicating the missing part. However, the writer discovered a quicker method some years ago and has used it many times since in emergencies.

The mechanic who wishes to make a screw with a left hand thread should first select a right hand tap with the number of threads per inch required. Then a rectangular piece of cold rolled steel is obtained (for example, ½ x 1 x 3 inches long), and a center line is inscribed lengthwise on the widest surface. A light prick punch mark is made one inch from the end of the piece, on the center line, and with this mark as the center the exact diameter of the tap is laid out with a divider.

A second hole is also laid out on the center line, the distance from the center of the first hole to the center of the second being equal to one-half the diameter of the screw to be cut plus one-half the diameter of the tap, minus the single depth of the thread.

The exact center distance established and laid out, a tap drill is selected that will leave from 50 to 70 per cent of thread when the hole is tapped. The hole for the tap is then drilled through the piece and tapped part way through, as shown in the drawing. The tap is then removed and the hole for the screw blank is drilled through. This done, the tap is replaced in the hole as illustrated. The block is gripped in the vise with the shank of the tap projecting downward, then the screw blank is inserted into the second hole and revolved to the left, cutting the desired left hand thread. With a little experience, any mechanic will be able to turn out good threads by this method.

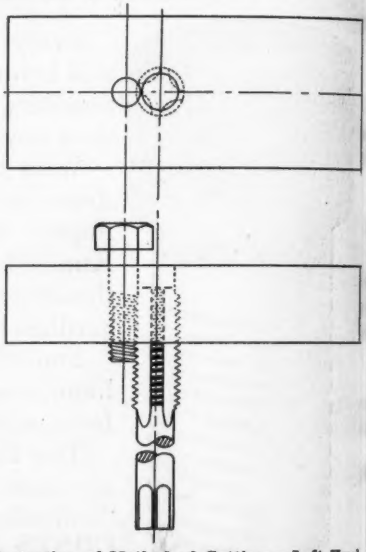


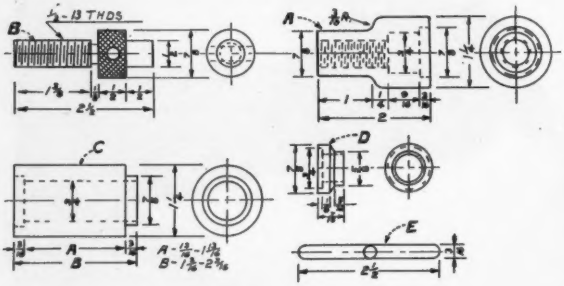
Illustration of Method of Cutting a Left Hand Thread with a Right Hand Tap

# A Handy Jack

By C. F. Fitz

IN GENERAL machine shop work, where the jobs are so varied that fixtures are out of the question, jacks are depended on to a large extent for blocking up work. The usual method of using jacks is to block the jack up with packing blocks in order to bring it to the proper height, which means that a great deal of time is spent in looking for blocks of usable size. And even then, the jack is usually not as secure or as safe as it should be.

To overcome the difficulties mentioned above, the jack shown in the drawing was designed and has been used with success. The jack consists of a base A threaded internally to receive the screw B, upon the end of which the cap D is held by riveting the end of the screw slightly. The piece C is a sub-base with a projection ⅞ inch in diameter on one end and the opposite end counterbored slightly larger than the projection. The outside diameter of the sub-base may be made any size that is most convenient for the bulk of the work in hand; the size shown on the drawing was most convenient for us. Any number of these sub-bases may be used to obtain the necessary height.




Details of "Handy" Jack

The piece E is the handle that fits into the hole in the knurled part of the screw B, and is used to adjust the jack screw to the desired height. The jack is not difficult to make, and one or more sets of such jacks will pay for themselves in a short time in a saving of time alone.

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### THE PRATT & WHITNEY BENCH LATHE AND ITS ATTACHMENTS

Toolmakers, die makers, and others who are concerned with the fine work that is done with the aid of high grade bench tools will be interested in a 16-page booklet that has been issued by Pratt & Whitney Company, Hartford, Conn. The booklet contains complete descriptions and specifications of the bench lathes and attachments made by this company, with descriptions and illustrations of the individual parts of the machines included.

The various attachments are also covered, each being taken up in turn, so that the prospective user can see exactly what tools are available for his work. A copy of the book will be sent free to any mechanical executive.

### "LITTLE LANDIS" PIPE THREADING AND CUTTING MACHINE

This folder contains a complete description of the "Little Landis" Pipe Threading and Cutting Machine—a machine that was designed especially for jobbing and maintenance threading. Each part of the machine is taken up in detail, and the text closes with a description of the motor and control, and coolant and lubricating systems. Complete specifications are included. Copies free upon request.

### MACHINING LAMINATED BAKELITE

In a new folder issued by the Synthane Corporation, Oaks, Pa., is presented much valuable information on the machining of laminated bakelite. The data is shown in a quick-reading chart form. Copies will be sent free.

# *Over the Editor's Desk*

HAVING some very definite ideas about the present state of governmental affairs, your editor finds it a bit difficult to talk about the industry for which this magazine is published without throwing more or less verbal bouquets and "dead cats". But this paper is concerned with the job of fabricating metal products, and not with politics as such.

We should, however, appreciate the fact that we are living in one of the most interesting, and perhaps we should say "critical", periods of the country's history. We are at a point where scientific study must be made of methods, production, and hours in all lines of industry in order to determine the steps that must be taken to provide employment for a sufficient part of the population to insure a reasonable prosperity.

We don't say "employment for everyone." There is never a time when every able-bodied man is employed. There are always a certain number of workers temporarily unemployed, to which may be added the floaters and migratory workers, usually termed "hoboes", who are always jobless even in prosperous times. In 1929—a year which is generally considered as prosperous—the persons qualified to hold jobs but who were unemployed numbered 3,000,000. So in discussing the number of unemployed, allowance will always have to be made for these 3,000,000 who seem for one reason or another to be permanently jobless.

Since March, 1933, 850,000 workers have gone back to their jobs of making machinery, clothing, shoes and food products. Durable industries; factories engaged in making iron and steel products, tools, lighting equipment and other materials needed for construction or for manufacture of consumers' goods have reemployed about 1,000,000 workers. There are still, however, about 2,000,000 plant workers of one kind or another who are idle.

Added to these are domestic servants who owe their unemployment largely to modern methods of living, and tenant farmers who have been displaced from farms due to crop reduction plans. An additional 500,000 consists of small business men who have had to close their establishments.

Workers have always migrated back and forth as suited their fancies between cities and the farms. During the past 25 years the trend has been from the farms to the cities, due to the constantly-increasing development of commodities for which markets had long existed and the resulting possibilities for employment at higher wages than had ever been paid before.

Whether there are too many people in the cities or in the country; whether they are producing too little or too much to take care of our domestic needs; whether they should be paid nominal wages for purposes of economy or high wages to provide purchasing power—these are some of the problems that will have to be worked out before everyone can be happy again.

The one thing that should never be doubted for a minute is that they will be worked out. We are a nation of educated people; not illiterate peasants, and we will never follow any wrong course very long.

# NEW SHOP EQUIPMENT

## J. & L. Universal Ram Type Turret Lathe

Jones & Lamson Machine Company, Springfield, Vt., has announced a line of "Ram Type" Turret Lathes, the design of which incorporates many new productive features. The machines are built in two sizes, for 1½-in. and 2½-in. bar capacities.

The fundamental purpose of the new design is to permit the use, at the highest efficiency, of the latest types of carbide cutting tools with ample margin for future developments in that field. At the same time the design includes all the factors of mechanism, convenience, and accuracy necessary for the performance of ordinary turret lathe operations with ordinary tools at the highest available efficiency.

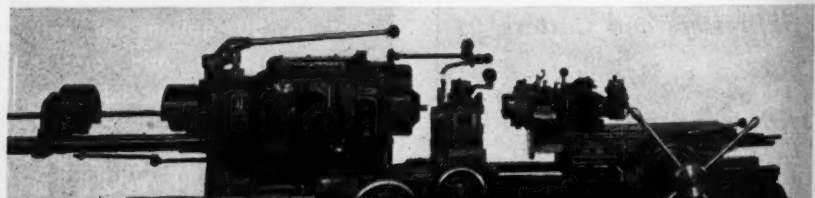
The headstock of the J & L Ram Type Turret Lathe is so designed that all speed changes are controlled by means of a single lever dial selector. The lever controls the forward and reverse motion of the spindle, and when it is moved to neutral position, an adjustable brake for stopping the spindle is automatically applied. The forward and reverse clutches and brake are of the multiple disc type.

The machine has 12 selective forward and reverse spindle speeds, two ranges of which are standard equipment: namely, 20 to 1,000 and 40 to 2,000. This range covers the requirements of all cutting tools from carbon steel to carbide. All shafts are mounted in anti-friction bearings, and all gears are of a high grade of alloy steel, hardened and ground. Sliding gears are mounted on splined shafts. All headstock gears are ground in the tooth form and run in a bath of oil. The main spindle is an alloy steel forging and is mounted on proloaded precision ball bearings. It is equipped with an 8-in. flange with a taper pilot.

Two types of driving units are standard: a flange-type motor mounted integral with the headstock, or a motor mounted in the cabinet leg with drive through multiple V-belts.

The bed is a double box ribbed casting of rigid construction. The ways which are of steel, carburized, hardened, and precision ground, are attached with screws to accurately-machined shoulders running the entire length of the bed. Leveling screws are provided in each leg of the machine.

The carriage is of the universal bridge type and is made exceptionally heavy for support of the many tools that may be in operation at one time. Standard equipment includes a square turret on the front end of the cross slide and a dove-



J & L Ram Type Turret Lathe equipped with collet chuck for bar stock

tail tool slide on the rear. The square turret is controlled by one lever. Each turret face is drilled so that a multiple tool block with a capacity of four tools can be mounted on each face. Provision is also made for maximum multiple tooling for rear mount tools.

Nine variable longitudinal and cross feeds are available, all controlled through a single lever dial selector. Feeds can be changed while the machine is running. The range of feeds for longitudinal travel is from 0.005 to 0.100 in., and the cross feed range is from 0.0025 in. to 0.050 in. per rev. of the spindle.

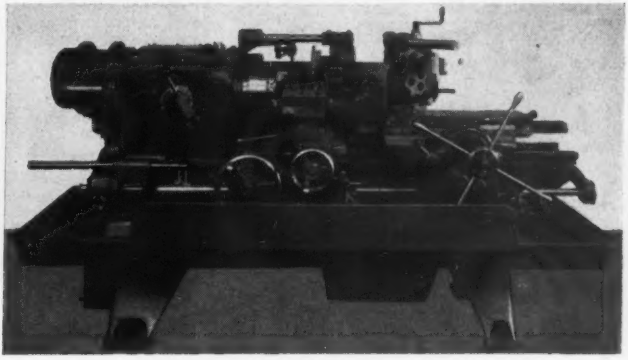
The carriage and ways are automatically lubricated by a force feed pump in the apron, and the gears run in a bath of oil. The shafts in the apron are mounted on anti-friction bearings. The carriage is equipped with a spool stop for longitudinal feeds and an adjustable stop bar, also a spool stop for the cross feed with adjustable stop dogs which will disengage the feed in either direction.

The feed for the carriage is automatically disengaged as the carriage comes in contact with a stop, or it can be tripped manually. The feed knock-off is against a positive stop. The apron is provided with a feed reversing lever and a safety friction clutch. A thread chasing attachment and a taper attachment are standard equipment.

The turret is indexed from one position to another with a star wheel, and is equipped with an automatic clamp ring. On the return movement of the slide the turret is unclamped and indexed to the next position, and on the forward motion is automatically clamped. The turret can, however, be indexed by hand.

The turret slide is of rigid construction, for heavy duty work, and has hardened bearing plates, adjustable taper gibs for side adjustment, and hardened hold down gibs. Nine feeds are available for the turret, from 0.005 in. to 0.100 in. per rev. of the spindle. The turret slide and saddle are lubricated by a force feed pump and the gears run in a bath of oil.

Cutting coolant is piped to the turret through the center pin and flows constantly to the turret face in working position. The collet chuck for bar stock has a master collet fitted with removable jaws for the different sizes and shapes of stock. The bar feed mechanism permits the operator to stand at normal operating position, unlock the collet chuck, feed the bar through the spindle, clamp the chuck and, while the machine is running, ratchet the stock carrier back—all by the use of a single lever.



**J & L Ram Type Turret Lathe equipped with chuck**

## Cincinnati No. 1-12 Plain Automatic Milling Machine

An automatic milling machine of a design that is said to make it particularly adaptable for milling low-cost of small parts in either large or medium lots has been announced by the Cincinnati Milling Machine Co., Oakley, Cincinnati, Ohio.

Eight spindle speeds are available up to 1800 r.p.m. by means of pick-off gears located in the column. Three series of speeds are obtainable; low, from 49 to 361 r.p.m., furnished as standard equipment unless otherwise specified, intermediate upon request, and high (246 to 1800 r.p.m.) at extra cost. Spindle reverse is provided. The starting lever that controls the spindle rotation is located at the left side of the machine.

Sixteen table feeds, up to 80 inches


**Cincinnati No. 1-12 Plain Automatic Milling Machine.**

per minute, are available with pick-off gears. The standard series ranges from 2 inches to 80 inches, and special series, from 1 to 40 inches, are available. The table has a complete working cycle which includes a sensitive control lever for engagement, 400 inches per minute power rapid traverse, and dog-controlled intermittent feed and rapid traverse in any combination or direction depending upon the type and number of table dogs employed.

The position of the control lever determines the direction of table travel and also whether the table is moving at feed or rapid traverse rate. The table movement can be stopped without affecting the operating cycle. Power longitudinal travel is 12 inches with rack feed. The table is located at a convenient height for fast work handling. The working surface is 8½x25¾ inches.

The machine is patterned after the usual Cincinnati Miller design in that it has a pyramid-shaped column with self-aligning rectangular dovetail overarm and light weight arbor supports. The knee is massive, incorporating long column and table bearings. There is no saddle and the knee is provided with hand adjustment of 8 inches vertically only. An unusually wide column bearing is provided for the knee, using taper gibbing.

The spindle has a National Standard No. 40 taper with 3½ in. of taper per foot, 1¾-inch diameter front end and 1 inch diameter at the rear end of the taper hole. The entire spindle drive rolls on anti-friction bearings. The spindle has a double mounting of anti-friction bearings with provision for self-compensation. All shafts are short, made of alloy steel with integral keys, and are hardened and ground.

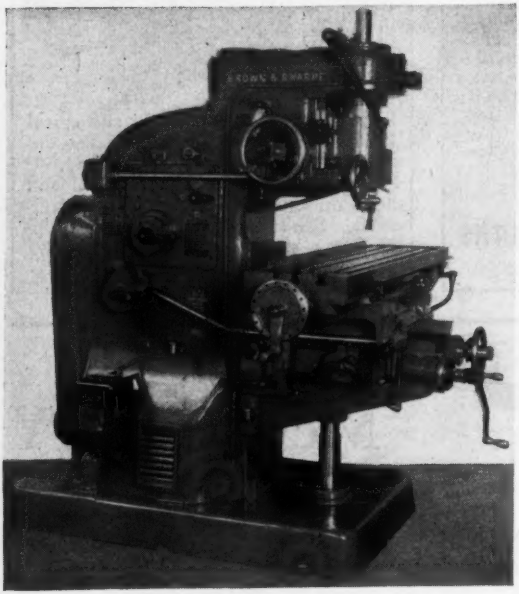
An automatic spindle stop can be supplied upon request. The stop may be used with automatic table working cycles and is employed as a means of preventing work from becoming marred by rotating the cutter during the return stroke of the table. The column mechanism, table-ways, and knee parts are automatically lubricated.

An accessible, completely enclosed motor drive with multiple V-belt drive to a constant speed pulley is provided, for which a 3 h.p. 1800 r.p.m constant speed motor may be used. A hinged motor mounting provides a convenient method of applying tension to the belt.

Standard equipment includes an arbor tightening rod, wrenches, support for Type A arbors with pilot end, complete sets of feed and speed change gears, and table dogs.

## Brown & Sharpe High Speed Vertical Spindle Milling Machine

To the Brown & Sharpe line has been added a No. 2 High Speed Vertical Spindle Milling Machine. While embodying the essential design and capacity of the regular No. 2 Standard Vertical Spindle Machine of the company's line, the new high speed machine has greatly increased ranges of speeds and feeds, together with other improvements.



B & S No. 2 High Speed Vertical Spindle Milling Machine

Thirty-two changes of spindle speed are provided, from 20 to 1,300 r.p.m., in geometrical progression in either direction. Changes are made by sliding gears in two series, controlled by means of a back gear lever and by rotating a single lever on the left side of the machine. The speed in use is indicated on a direct reading dial, one revolution of the lever giving a change in speed. Due to the higher speeds, the back gear range has also been increased, providing 16 back gear speeds to 150 r.p.m. All gears in the speed train are alloy steel with integral keys, all bearings being anti-friction.

Thirty-two changes of feeds are also provided in practically a geometrical progression from 7/16 in. to 62 in. per minute. Changes are made by a single rotating lever controlled either from front or rear operating position. Direct reading dial indicates the feed engaged, one turn of the lever being required for each rate of feed. The feed drive is by alloy steel sliding gears with integral keys mounted in a unit assembly feed case, all bearings being anti-friction. The usual automatic feed for the spindle head is provided with automatic release at any point and also fine hand feed with quick return. The head is counterbalanced.

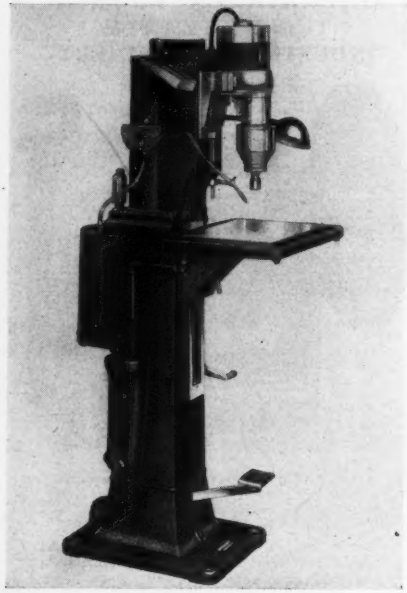
Operating control levers have been so arranged that the machine can be conveniently controlled from either front or rear operating position. Hand controls for transverse and vertical feeds are automatically disengaged when power feed is engaged. A new safety hand-crank is supplied for the longitudinal feed control. The machine can be arranged for either motor drive or belt drive. The motor driven arrangement, shown in the illustration, provides for completely enclosing the motor in the base.

## Haskins No. 2 Tapper

The R. G. Haskins Company, 4646 W. Fulton St., Chicago, Illinois, has developed the high speed tapping machine here illustrated, in which a number of improvements over the previous machine are incorporated. All of the new developments and improvements found in the Haskins No. 2 tapper are now incorporated in the No. 1 tapper, insofar as they could be used. The range of the Haskins No. 2 tapper overlaps that

of the No. 1 from No. 10 taps up to and including 5/16 in. in steel, ⅜ in. in cast iron and 7/16 in. in brass and other non-ferrous metals.

A powerful ½ h.p. motor, operating at 3450 r.p.m., supplies ample power to



**Haskins No. 2 Tapper**

drive the largest tap within the range of the machine without overloading. Two change gears are furnished standard with each machine, giving speeds of 1100 and 1750 r.p.m. Reverse speed is double that of the tapping speed. Motors to operate on 50 or 60 cycle, single phase, as well as three phase and direct current, can be supplied.

The tapping unit is mounted on two vertical shafts which slide in long bearings that are line reamed and lapped to insure perfect alignment and permit free action of the tap head assembly. The tap head and motor unit can be adjusted vertically, and are counter-balanced by suitable mechanism so as to give the machine a free-floating sensitive action. Adjustable stops are located in the middle of the frame to limit the vertical travel of the tap unit.

The accurately ground and balanced tap spindle, complete with the double cone clutch, collet and cap, weighs only eighteen ounces. Due to the resulting lack of inertia, blind holes can be tapped without fear of breaking taps, even though the tap hits bottom. There is absolutely no float in the tap spindle, insuring the most accurately tapped holes. Reverse of the tap is automatic when the pressure on the foot pedal is released.

A feature of the machine is found in the tap spindle, which is so designed that, by the removal of the collet chuck cap, a standard acorn die and holder can be installed, permitting external threading at the same high speeds as are used for tapping.

The tapping unit is entirely enclosed in a rigid two-piece aluminum housing, is readily removed from the machine and precision ball bearings are used throughout in the construction of this head. Five accurately ground, light-weight collets are furnished standard with each equipment. The collets drive the tap by the square on the shank, and accurately center the tap.

The work table is adjustable vertically by means of a crank located on the side of the pedestal base. A locking lever is

conveniently located to hold the table rigid.

A cast iron pedestal frame supports the motor and tap unit, which is operated by a foot treadle. This method of operation leaves both hands of the operator free to handle parts for tapping. The foot treadle is equipped with a suitable spring mechanism so that the tap establishes its own lead without stripping the threads or breaking the tap.

## G & L No. 25 Hydraulic-Feed Surface Grinder

The Gallmeyer & Livingston Co., 334 Straight St. S. W., Grand Rapids, Michigan, has added to its line of surface grinders a hydraulic-feed grinder to be identified as the No. 25. The machine is built around a one-piece column and base casting, insuring a permanence of alignment between the cross saddle ways and the upright head ways. This casting weighs over 1,000 lb., and the weight is so distributed as to insure rigidity.

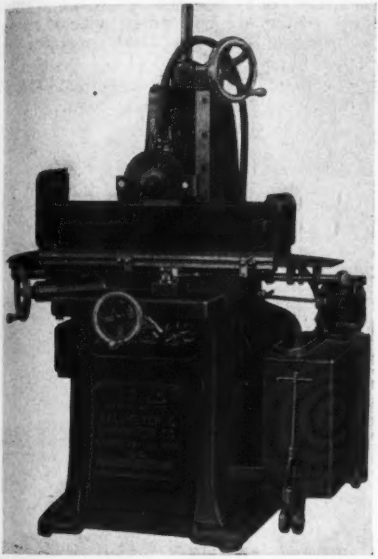
The working surface of the table is 6x18 inches, and the automatic longitudinal and transverse movements are sufficient to enable the operator to cover the entire working surface of the table with a ½-inch wide wheel, which is standard equipment.

The hydraulic mechanism, driven by a 1 h.p., 1200 speed motor, is mounted inside the base of the machine. The mechanism is conveniently accessible from either front or rear. Practically any desired longitudinal table speed up to a maximum of 50 feet per minute is instantly obtainable. The speed is controlled through a lever on the front of the saddle. The machine is available with automatic cross feed or hand cross feed, as desired.

The user has a choice of two types of motor drive. Where 50 or 60 cycle current is available, the machine can be furnished with a 1 h.p., dynamically-balanced ball bearing motor mounted directly on the grinding wheel spindle. A 7-inch diameter grinding wheel is standard equipment with this construction.

The second type of spindle drive consists of a 1 h.p., dynamically-balanced motor, mounted on an adjustable bracket attached to the spindle housing with a Tex-rope drive to the grinding wheel spindle. With this construction is fur-

nished an 8-inch diameter grinding wheel, and the spindle speed available through the Tex-rope drive is correct for a wheel of that diameter. An extra interchangeable motor sheave and extra Tex-ropes can be furnished so that, when a number of worn wheels have accumulated, the motor sheave can be changed



Gallmeyer & Livingston No. 25 Hydraulic-Feed Suction Grinder

to increase the spindle speed for wheels of the small diameter.

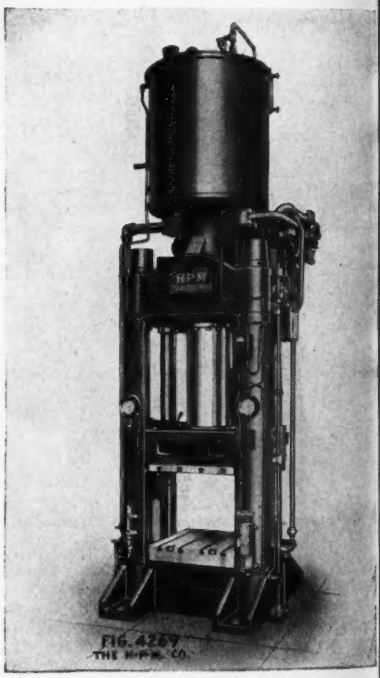
The machine can be had with self-contained motor-driven dust arrestor system, and is also available with the portable self-contained motor-driven coolant system illustrated. The cover of the tank carries a vertical ball bearing motor upon the shaft of which is mounted a spider-type vane pump. No bearings are under water, and no stuffing boxes are necessary.

## H-P-M Long Stroke Drawing Press

To provide equipment especially designed for the deep drawing operations now required on automobile head lamps and similar work, The Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio, has brought out the H-P-M Long Stroke

Drawing Press shown in the illustration. The press is in the H-P-M Hydro-Power Fastraverse class, and is equipped with the H-P-M synchronized-pressure die cushion.

The H-P-M die cushion applied to the Hydro-Power press particularly fits it for performing unusually deep draws in single press operations. This cushion is actuated by a series of hydraulic cylinders which are connected with the same source of pressure that operates the



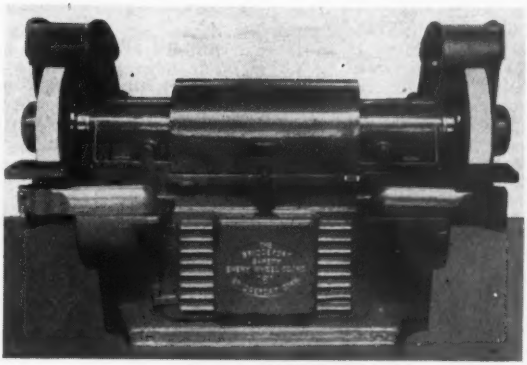

**H-P-M Long Stroke Drawing Press**

press itself. Thus the action of the die cushion is synchronized automatically with press movements and pressure, the blank-holding pressure being automatically proportioned to the drawing pressure.

The Hydro-Power Fastraverse Press, including the die cushion, is completely self-contained with direct-motor drive through the H-P-M Hydro-Power unit, mounted on the press head, and fitted with a complete system of H-P-M patented controls for both press and

die cushion. The operator's press controls, including gauge, are conveniently grouped on the right hand press column, while the die cushion pressure regulator and gauge are located at the left.

The H-P-M Hydro-Power Die Cushion is an exclusive development of the Hydraulic Press Manufacturing Company for use in connection with its line of H-P-M Hydro-Power presses for metal-working.



Bridgeport No. 161 High Speed Floor Grinder

## Bridgeport No. 161 High Speed Floor Grinder

The Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn., has brought out a high speed floor grinder in the 16-in. size, to be known as the No. 161. Large hole wheels are used, and the machine is built so that three speeds are available, with changes at regular intervals, from a maximum of 9,500 surface feet per minute to a minimum of 8,000 surface feet per minute. Thus a 24-in. wheel can be used down to 15 in. diameter, leaving a stub that is 15 in. diameter with a 12-in. hole. The speeds are governed by spark breakers.

The wheel change is governed by the largest wheel. When the largest wheel

is worn down to the point where a change in speed should be made, an alarm sounds. An individual spindle is used for each wheel, the spindles being coupled together and driven from a common sheave on the right hand spindle. The result is that the V-belts can be readily changed, it being necessary merely to loosen and slide back the split half coupling so that the belts can pass through.

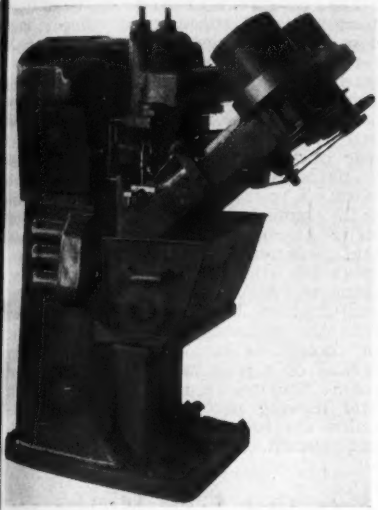
Each spindle is carried in two heavy duty Timken bearings which are sealed against the exit of lubricant and t entrance of foreign matter. A featu of the machine is the means employe to regulate belt tension and chan speeds. The motor is moved by the u of a lever which has sufficient purcha to readily move the motor, yet not much as to produce excessive tension the belts. Further, the motor is locate on an incline, thus the movement r quired is slight. Quick-acting clam arrangements provide for locking t motor in the proper position.

Specifications are as follows: Size grinding wheel, 24x4x12-in. hole. Moto 10 h.p. Speeds for high speed whee 1512, 1814, and 2134 r.p.m. Diameter spindle in bearings, 3⅞ in.; in flange 3 in. Distance between wheels, 57½ i Height, base to center of spindle, 33 i Size of base at bottom, 52x37 in. Leng overall, 76 in. Diameter of flanges, 15 i Approx. net weight, 4450 pounds.

## Globe Type A Automatic Hopp Feed Tapping Machine

The Globe Tapping Machine Compan 751 Central Avenue, Bridgeport, Co necticut, has developed an entirely aut

matic hopper feed machine known as the Globe Type "A". The machine will produce from 120 to 180 pieces per minute of single hole parts either tapped, drilled, countersunk, threaded, and hollow milled. Rate of production depends upon the size of the part, size of the tap and depth of the thread.



Globe Type A Hopper Feed Tapping Machine

Ordinary commercial straight shank high speed taps are used.

The illustration shows the type A machine with two hoppers, six chutes and six ball bearing tapping spindles. This particular machine was built for a large manufacturer of special nuts and was arranged for a special type sleeve nut having a 10-24 thread 7/16 inch deep. A quantity of nuts are dumped into two hoppers and as they revolve the nuts are fed down through the six chutes and are tapped and ejected at a rate of 150 complete nuts per minute. A similar machine, built for a large automobile manufacturer, was arranged for countersinking automobile parts at a rate of 150 complete parts per minute.

The machine is not limited to handling one part; different types and sizes of parts can be handled merely by changing the chutes and an adapter ring in the hoppers and relocating the

spindles, which are adjustable for location. The spindles are so constructed that the tap follows its own lead, permitting the use of different sizes on the same machine. This type A machine is for handling parts that can be hopper fed and should not be confused with the dial-type machine built by the same company.

The construction and drive of the machine is of rugged and compact design and is entirely equipped throughout with ball and roller bearings. The entire drive is from a 2 h.p. motor mounted on a tilting plate in the rear base. From the motor, the drive is by belt to the clutch pulley on the upper rear of the machine and then through a hardened and ground nickel steel worm, a phosphor bronze worm gear, both mounted on precision tapered roller bearings, heat treated steel rack and pinion and heat treated steel gears meshing with the tapping or drilling spindles. All shafts are mounted on anti-friction bearings. A tank is cast into the pedestal from which a stream of coolant is supplied to the taps by means of a gear driven pump mounted inside the machine. All bearings, shafts and moving parts throughout the machine are lubricated by a one-shot oiling system.

## Grob Filing Machine Model B-3

Grob Brothers, S. 97th Street and W. National Avenue, West Allis, Wisconsin, announce a bench type, model B-3 filing machine. Like the previous models, this machine cuts continuously by means of an endless file-chain which has made the filing of dies, punches, templates and other similar miscellaneous parts a high production operation.

The machine has a three speed V-belt drive and a positive drive to the file-chain. Proper tension on the file-chain is always assured as the upper sheave is fastened to a hinged bracket which is held in position by a long extension spring.

An improved feature is the arrangement for the quick release of the tension on the file-chain. A single movement of a lever on the upper left side of the machine connected with a cam moves the idler sheave downward. With this provision, the time required to set up for internal filing and to change file-chains is reduced to half a minute.

The file-chain is of simple self-locking design and carries 19 files 3 inches long each. The files are guided firmly by a full support back rest and thereby provide such smooth cutting action that the passing from one file to the next can not be felt by the operator.

Material up to 4 inches in thickness can be filed and the file-chain can be inserted into openings as small as ⅜ inches in diameter. All sheaves and pulleys are mounted on sealed ball bearings. The tiltable table, 15x17 inches in size, is 14 inches above the bench and the total height of the machine is 29 inches. The machine is equipped

**Grob Filing Machine Model B-3.**

with a ¼ h.p. motor and weighs 175 pounds.

## Carborundum Company Introduces Grinding Wheel of Crushed Diamonds

At the recent National Metal Congress, The Carborundum Company, Niagara Falls, N. Y., announced and demonstrated the Diamond Wheel—a grinding wheel made from genuine South African diamonds. The use of diamonds in a grinding wheel has, of course, been influenced by the constantly increasing hardness of various types of tool steel and alloys, and by the introduction of the cemented carbides. Gradually metal hardness has been approaching the hardness of the manufactured abrasives until now there has arrived the hardest of all manufactured materials in the form of turning tools—the cemented carbides.

The diamonds used in the manufacture of the new wheel are not of the so-called black or carbon type. They are yellows, white and greys of the gem diamond variety, but of course are sufficiently off-color and in such small sizes or weights as to be not desirable as gems. By a special process the diamonds are crushed and the diamond grains or grits most accurately graded through a series of standardized screens.

The diamonds are held in the new wheel by a bond that is tenacious, tough, and durable, which permits the permanent holding of the tiny diamonds securely while giving them full opportunity to cut. The bond was developed in The Carborundum Research Laboratories.

It is obvious that regular or solid wheels with diamonds as the abrasive would be prohibitive in cost, so a composition form or backing was devised to which is applied a coating of the diamonds and the bond. This layer about one eighth of an inch thick is applied to the side of the wheel for side grinding and to the periphery of the form for cylindrical and other types of grinding. The wheels are then baked by a specially developed process.

Frank J. Tone, President of the Carborundum Company, with a grinding wheel made of crushed diamonds.

Throughout the entire process the wheels must be made to micrometer exactness, and they are balanced within a fraction of a gram. They are so hard that it is impossible to turn or dress them to size.

The wheels are made in three grits, the comparatively coarse, 90 grit; the fine, 220 grit, and the extra fine, 400 grit. With this range of grits it is possible to do the comparatively rough

grinding or stock removing with the coarse wheel, to produce an edge comparable to a lapped edge with the fine wheel, and to create an exceedingly keen edge and a mirror surface finish, where such finish is required, with the extra fine wheel. There is no overheating of the material; in fact, the operator could force the tool against the wheel with all possible hand pressure without it becoming even uncomfortably warm.

It is interesting to note that the diamond wheels need no dressing; in fact, it is impossible to dress them. They are cleaned or freshened by a wet scrubbing operation, using pumice or a soft grade abrasive stick. The thousands of tiny diamonds do not break down or crush. They seem to stay permanently sharp and are so affixed in the special bond as to preclude the need of dressing, even if it could be done.

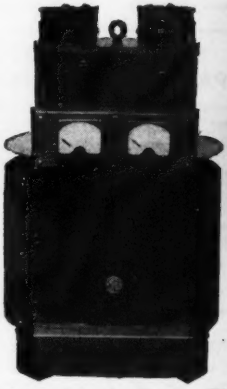
Limited stocks of these wheels are now available in 6 and 7-inch diameters in the coarse, fine, and extra fine grades for peripheral and side grinding. Other sizes will be carried just as soon as further uses and consequent demands for the new wheel are developed.





## General Electric A. C. Arc-Weldi Equipment

In addition to its line of direct cu rent arc-welding equipment, Gene Electric Company, Schenectady, N. Y now has available a complete line alternating current arc-welding equi ment including transformer units, ele trodes, and automatic welding hea and control. The new a.c. equipment intended for heavy-current welding primarily automatic welding because



General Electric A. C. Arc Welding Equipment

the heavy currents involved, but othe wise equally well suited to hand appli cations.

A.C. arc welding is not new, but th remarkable development of arc-weldin electrodes during the last few years ha only recently made it possible to bene from the major advantage of the a. process, that advantage being the ab sence of magnetic blow in the arc, an therefore superior quality in the resul ing weld. It follows, of course, that th advantage becomes particularly appare with the heavier welding current (above 250 amperes) because of th greater magnetic effect at these cu rents. Slightly greater welding spee are possible when using alternating cu rent, and in making fillet welds and working into corners and other par of intricate structures, the a.c. arc pe mits penetration to be obtained.

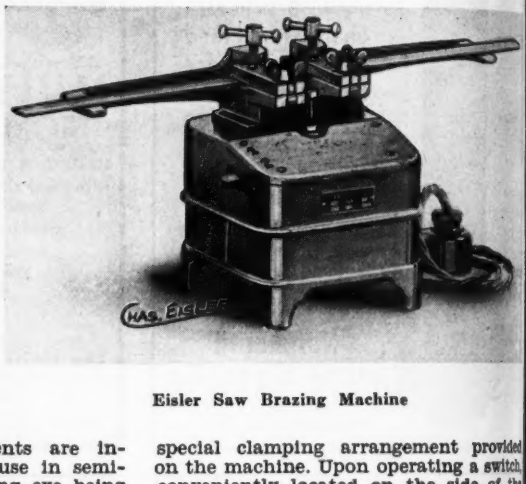
The new transformer units are avai able in three sizes having one-hour ra ings of 500, 750, and 1000 ampere Primaries are wound for 220, 440, or 5

volts; 60, 50, or 25 cycles; single phase. Extra attachments are available for reducing the secondary open-circuit voltage to approximately 50 per cent of its normal value (normal being 80, 90, or 100 volts), and for obtaining currents down to 10 per cent of one-hour rating.

The transformers themselves are of the high-reactance type, air-cooled and enclosed in a sturdy cylindrical shell. A suitable arrangement is provided to vary reactance so that the full welding range of the equipment can be obtained on any one of the three secondary open-circuit voltage settings—the latter being selected by means of taps on the primary winding.

The electrode recommended for the a. c. process is the General Electric Type W-23, a heavily coated electrode especially suited to a. c. welding.

The new a. c. equipments are intended primarily for shop use in semi-permanent locations, a lifting eye being provided on top of the transformer unit by means of which the set can be readily moved by a crane.




Eisler Saw Brazing Machine

## Eisler Saw Brazing Machine

The Eisler Engineering Company, 759 So. 13th Street, Newark, N. J., is now marketing electric brazing machines for joining band saw blades or flat stock. The machines operate on 110 or 220 volts, A. C., and are made in four sizes for brazing widths of stock up to 3.25 inches.

The parts to be brazed are first pointed and beveled to a knife edge. They are then lapped along these edges and held in position by means of a special clamping arrangement provided on the machine. Upon operating a switch, conveniently located on the side of the machine, the current is turned on, heating both parts of the blade and a piece of spelter simultaneously.

When sufficient heat has developed to melt the spelter, the current is turned off. The brazed section is compressed between the jaws of a special tool after which it is reheated for annealing. These compact brazing machines, one of which is shown in the illustration, require very little space and perform highly satisfactory work in a rapid and economical manner.

## Zeiss-Ikon Stroboscope

To facilitate the study of rapidly moving machine parts and their functions while in motion, a new type of stroboscope of Zeiss-Ikon make is being introduced in this market by the George Scherr Company, 128 Lafayette Street, New York City, N. Y.

In this instrument, the part in motion is observed through a rotating slit disc the speed of which can be readily regulated and timed to coincide with that of the moving object. In this condition the object will appear to be stationary and permit its examination. By a slight reduction of the speed of the slit disc, the phase under observation can be moved so as to cover the entire range of the period.

In addition to the observation of kinematic processes, the Zeiss-Ikon stroboscope may also be used as a tachometer, being equipped with a built-in speed indicator which permits the measurement of speeds up to 140,000 r. p. m. strictly optically; that is to say, without being in contact with the rotating part itself.

The Stroboscope may also be equipped with a pair of prism binoculars, where it is desirable to get a closer view of the object, or where it may be too dangerous (as for instance on airplane propellers) to approach it too closely.

The instrument may be used on a very wide range of speeds simply by exchanging slit discs, of which 7 containing from 1 up to 24 slits respectively, are furnished as standard equipment. The outfit is readily portable and may be used by holding the stroboscope by hand or by mounting it on a tripod. The design is thus fully universal to suit the needs both of the workshop and the laboratory, furnishing the means of determining and controlling the uniformity of kinematic processes and other periodic operations with a great degree of accuracy.

Zeiss-Ikon Stroboscope



## Cogsdill "Bearingizer"

A new development in tools for accurately sizing and finishing the surfaces of inner bearings and similar mechanical parts has been developed by the Cogsdill Mfg. Company, Detroit, Michigan. The operation is called "bearizing," and the principle of the tool is similar to that of a swaging machine turned inside out. The body of the tool is an arbor on which are machined a series of cam surfaces and which has a shank for attachment to the spindle of the machine with which it is used. Surrounding the cam section is a retaining cage carrying a number of accurately-made small rolls.

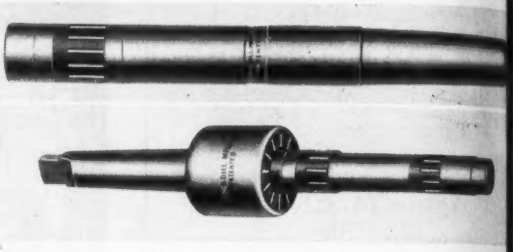
A hole that is to be bearingized is reamed or otherwise finished to leave 0.002 to 0.003 in. on small holes and larger amounts on larger holes. The bearingizer is then inserted into the hole while revolving at a high rate of speed. As the tool revolves in the hole, the cam surfaces strike the rolls, which are driven

out against the wall of the bore, driving the metal back into itself and producing a grain flow in the metal structure. This metal flow closes the pores in the metal, condenses and hardens the surface, removes the high spots and irregularities that may have been left in the previous operation, and produces a burnished surface with a maximum of bearing area.

The amount of metal that can be displaced is dependent upon the nature of the material, the character of the finish left in the preceding operation, the rigidity of the supporting walls, and the quality of finish desired.

Speed is a vital requirement of the bearingizing operation, as the rolls must be driven outward with sufficient force to overcome as far as possible the elastic nature of the material and cause it to "set" in the peened position. The operation is extremely rapid, only one pass being required at a rate similar to hand feed reaming. Very little power is required and many parts are processed being held in the operator's hands.

The process is being used in tap holes and on angular and flat valve se and seal faces, also for surface finishi and accurate sizing of turned and grou shafts and spindles. Thus far each ap



(Above)—Bearingizing Tool for Single Bearing. (Below)—Tool for Bearingizing Flat Face and Two-Step Bearing.

plication requires individual engineeri consideration to arrive at the prop combination of conditions to produce th accuracy and finish desired. Tools ca be constructed to process two or mo diameters and in connection with fl surfaces all in one operation. They ca be made to process reasonably close t the bottom of a blind or shouldered hol

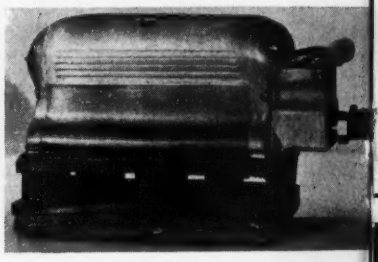


## Sterling Speed-Bloc Sander

One of the most unique sanding an polishing machines ever designed for in dustrial use is being introduced by th Sterling Products Company, 314 Curti Bldg., Detroit, Michigan. It weighs seve pounds, and operates on 70 pounds o more of compressed air, thus making i suitable for small shops as well as th heaviest production lines.

The design of the Sterling Speed-Bl Sander is unusually unique in that sanding motion is an oscillating or ciprocating one. The stroke travel the abrasive pad is 1¼ inches, at rate of between 2500 and 3000 oscill tions per minute. The pad moves ba and forth with the same motion as hand sanding, hence it does not lea a grain in the surface.

The motor is especially designed f sanding duty. It is simple in constru tion, rugged and compact, and is seal in an aluminum case which protects from abrasive dust and water. The san ing pad is driven directly from the mot It is made of specially impregnated ru ber and felt and is bridged in such manner as to be fully flexible, hence

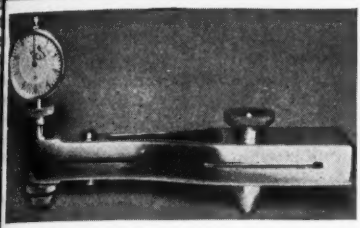


**Sterling Speed-Bloc Sander**

is applicable to convex or concave su faces, along mouldings, and in plac difficult to sand.

Several sheets of abrasive may be a tached to the pad at one loading. standard grade abrasive, of coarser mes may be used than with hand sandin The speed and evenness of the strok tend to keep the abrasive free of clog ging of balling, with consequent long wear.

Due to its light weight and sma size (7¾ in. long, 4¾ in. high, an 3¾ in. wide), the Sterling Speed-Bl Sander can be used on all types of wo for long periods of time without tirin the operator. The operator may wo overhead and in the most difficult po sitions with a minimum of physical ef fort. For wet sanding, a water conne tion is provided with a series of open ings on each side of the machine, pro ducing a spray that is easily adjuste to the need of the work.



*A NEW*

**Portable Brinell Hardness Testing Outfit**

**Type M60-750**

Adapted to Test of Full Range of Metals from Lead to Hardened Steel.

Three Sizes of balls.

Calibrated for loads from 60 to 750 kg.

*Outfit complete with magnifier $147.00*

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930 Investment Bldg., Washington, D. C.

# Columbia TOOL STEEL

SUPERDIE is a High-carbon, High-chromium die steel for long runs and work of excessive abrasion.

It takes extreme hardness and is practically non-deforming.

*It pays to use Good Tool Steel.*

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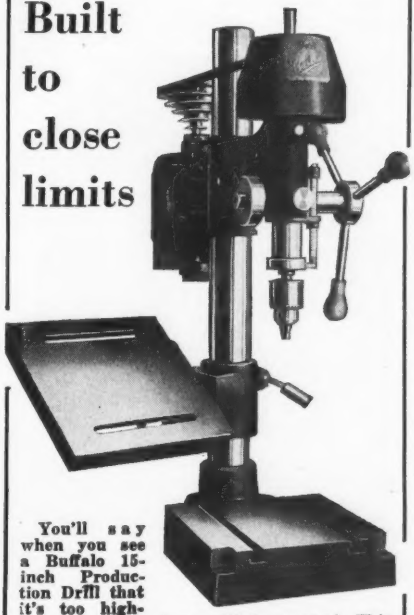
# ACCURATE

## Because Precision-Built to close limits



You'll say when you see a Buffalo 15-inch Production Drill that it's too high-priced for you—but you'll be wrong! This husky, well-designed drill—new from spindle to base—sells at a price which competes with many inferior tools now on the market.

It's accurate to an extreme—with a long-life, built-in accuracy — it's rigid because of the extra heavy construction. Head equipped with double row ball bearings at top of spindle as well as two additional sets, thus assuring extreme accuracy, rigidity and smoothness of operation. Runs smoothly at speeds up to 10,000 r.p.m.

FLOOR AND BENCH TYPES—described in Bulletin 2951. Write for this and prices now if you are interested in real VALUE.

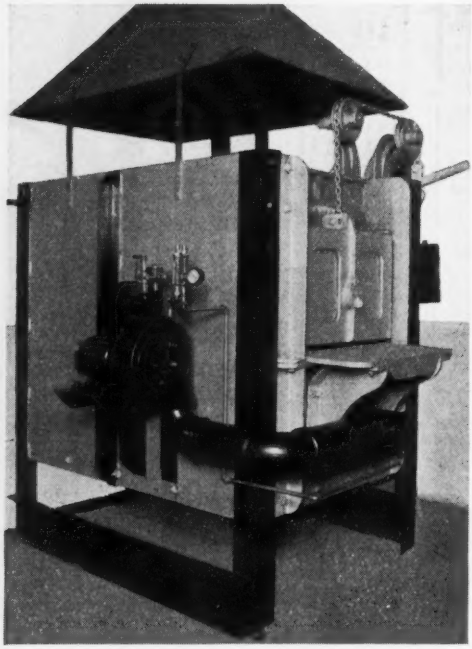
**BUFFALO FORGE COMPANY**

388 Broadway, Buffalo, N. Y.

In Canada:
Canadian Blower & Forge Co., Ltd.,
Kitchener, Ont.

## The "R-S" Model DI Low Pressure Oil Burner for Heat Treating Furnaces

The modern need for heat treatment on practically all types of metal products necessitates some type of heating furnace or oven in practically every industrial plant, but thousands of these



**"R-S" Model DI Low Pressure Oil Burner as applied to a small heat treating furnace.**

installations require only small units. With a view to developing a complete unit at a comparatively low cost, the research and development division of the R-S Products Corporation, Philadelphia, Pa., has developed the oil-burning unit shown in the illustration. The unit is installed on a furnace of the standard type.

The unit includes all the parts required for operation in a single unit, ready to install. The unit also includes automatic ignition through the hand-operated starting switch. The feature of the unit is said to be the low cost of installation as compared to the cost assembling and erecting the diffe parts.

It is said that the burner will found most useful on small ovens furnaces. The DI burner is adapta to any heating operation up to its ca city, and any grade of light fuel oil be used down to what is known as 3 classification. It can be tied with any of the recognized syste of pyrometric control.

The blower is contained in t main housing, where it is direc connected to the motor shaft, up which is also located the dri wheel for the V belt that dri the pump. The motor is of t fully enclosed type, and can located in any industrial pla without fear from dirt or har ful atmosphere.

The average time of heating furnace from room temperature 1600 deg. F. is 1 hour and 15 mi utes. The means of control of t DI burner is dependent upon t character of the operation, a the desires of the operator. Th are numerous types of equipme for controlling. An automatic ti switch can be applied if desir to automatically start the fu nace at any desired time, such an hour before starting time the morning.

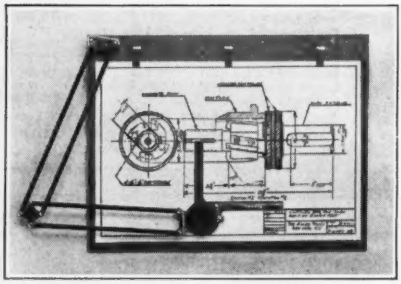
The burner is furnished wi blower, atomizer, pump, strain starting and stopping switch, s nal light, set of tools, extra ato izer, V-belt and guard, and co plete instructions for installi Where gas ignition is used, sta ard equipment includes the p burner pilot with hand valve. case of electrical ignition, tra former and complete electro assembly are included. It is n that the installation of the burn is simple, no technical help be necessary.

## "Drafto" Portable Drafting Machine

In modern drafting rooms the dra ing machine is essential equipment. gives freedom of thought and action a makes possible the speed that moder competition demands.

The illustration shows a drafting ma chine which, while providing the draf man with all the advantages possib

can be carried about and used in places where the larger and more permanent machine would be impossible. It can also be stored in a relatively small space. The machine is especially intended for



"Drafto" Portable Drafting Machine

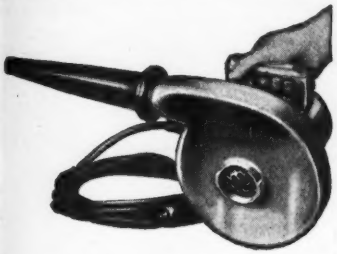
the engineer or draftsman who must make drawings out on the job, or for the foreman or other executive who is required to make drawings or sketches in his own department, or for the technical or trade school student.

This drafting machine called th "Drafto", has been placed on the marke by The Drafto Company, Meadville, Pa 444 Poplar St. No scales, triangles, T square, or thumb tacks are needed wit the "Drafto" machine; the only tool required are a pencil and a compass The Drafto machine is a compact uni with no loose parts. It is light in weight and can conveniently be carried in a brief case. It operates smoothly and easily, and the scales reach all parts o the paper. The mounting bracket per mits the vertical scale to slip under it so that the horizontal scale can reach the extreme upper left-hand corner of the drawing.

The clamps will hold securely either a single sheet or pad, and are arranged so that they do not interfere with the movement of the vertical scale. The board will accommodate paper up to and including 8½ x 11 inches. The protractor is graduated to 2 deg. Both scales may be moved 180 deg., or a complete half rotation. This feature is invaluable in making angular divisions of a circle or other figure. The two scales are made in one piece; thus they are never out of square with each other.

## Ideal "Jumbo" Model Portable Electric Blower

Recently added to the Ideal line of portable electric cleaners made by the Ideal Commutator Dresser Co., 1031 Park Ave., Sycamore, Ill., is the "Jumbo"



**Ideal "Jumbo" Model Portable Electric Blower.**

Model electric cleaner shown in the illustration. The Jumbo has three distinct functions, it blows, suctions, and sprays. It is designed for heavy-duty cleaning of dust, dirt and lint.

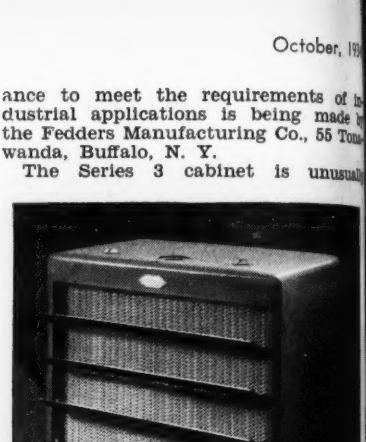
The Jumbo is powered by a 1 h.p.

General Electric motor, which is sufficient for a water column lift of 46.25 inches or a fan diameter of 2½ inches. Its 275-mile-per-hour blast of clean, dry air blows or vacuums all the dirt from motors, machinery, and other places that are difficult of access. With the sprayer attachment, it can be used to spray paint, lacquer, oil, or any other liquid.

## Fedders Series 3 Unit Heater

Announcement of their Series 3 line of Unit Heaters with important improvements in design, quietness and appearance to meet the requirements of industrial applications is being made by the Fedders Manufacturing Co., 55 Tonawanda, Buffalo, N. Y.

The Series 3 cabinet is unusually



**Fedders Series 3 Unit Heater.**

sturdy, being electrically welded into one piece with integral reinforcing members providing a high degree of strength and rigidity. Special attention has been paid to the factor of quietness. Streamline tubes, patented fins, and sturdy cabinets combined with resilient motor mountings eliminate resonance and isolate vibration.

The streamline tubes provide large steam ways. Header tanks have integral baffles to assure even steam distribution throughout the element. Specially-designed full floating mountings maintain the alignment of the heating ele-

ment within the cabinet, eliminate expansion stresses between the element and cabinet and protect the element from piping strains. Efficiencies of heat transfer surface, air velocities, and final outlet temperatures are balanced with each other. Fedders Series 3 Unit Heaters are made in a complete line of capacities up to 1200 sq. ft. E. D. R. steam.

## Kux Hi-Heat Material

A molded material with an exceptional combination of physical qualities which make it an ideal material to use where resistance to heat and corrosion is a necessity, called "Kux Hi-Heat" Material, has been placed on the market by Kux-Lohner Machine Co., 2147 Lexington St., Chicago, Ill.

Kux Hi-Heat Material is non-oxidizing and is highly resistant to corrosion, even at high temperatures. The grain structure is fine, dense, hard, and tough, and it increases in ductility and strength up to red heat. The material has a tensile strength of 45,000 to 50,000 lb. per square inch, with a hardness of 250-270 Brinell.

There is no grain growth at any temperature under 1800 degrees. The coefficient of expansion is high, the material always returning to original size upon cooling. Due to the density of the grain structure, the material is capable of taking a high and permanent polish. The manufacturer states that the development of Kux Hi-Heat Material has solved for the first time the production of aluminum base alloy castings by means of a plunger, and also insures an increased life for the metal pots, plungers, plunger sleeves, nozzles, and other parts. The material is said to be equally as effective for metal pots, ladles, and other equipment used in making castings by the hand, slush, or permanent mold processes.

Kux Hi-Heat Material is said to be

especially adapted for the manufacture of annealing boxes, melting pots for non-ferrous metals, oven and furnace doors, fire boxes, stoker parts, and other similar equipment.

## Chart for Nickel Alloy Steels

The International Nickel Company, 71 Wall St., New York, N. Y., has prepared a circular chart which shows at a glance the nickel alloy steels and treatments required to provide yield points between 55,000 and 175,000 lbs. per square inch, in sections of from 1 to 12 inches. The chart is intended as a general guide, and refers only to simple shapes.

The corresponding tensile strengths, Brinnell hardness, elongation, and reduction of area are also indicated.

The figures given represent typical values taken from an assembly of representative data obtained from numerous tests on the nickel alloy steels of 0.20 to 0.50 per cent carbon content. By means of this chart these data are presented in convenient form as a general guide to the selection of steels for bars, shafts, and forgings of simple shape.

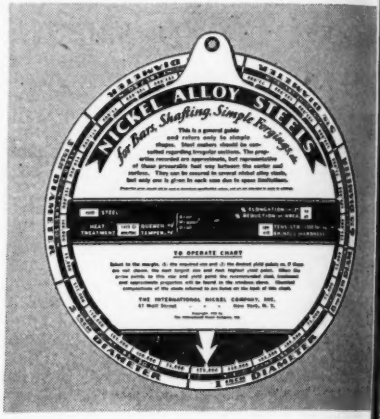



Chart for use in selecting Nickel Alloy Steels.

The chart is 8 inches in diameter. It is printed on cardboard and is attractively designed in two colors. Copies will be sent without charge, upon request, to engineers connected with design or maintenance, plant executives, purchasing agents, or steel salesmen.